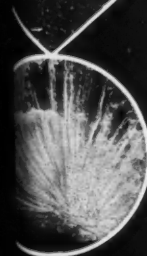


CHEMISTRY



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Editorial:

Energy Rampant
Inside Front Cover

50¢

Energy Rampant

► ONE OF THE most important ways that our present civilization differs from the kind of world in which our progenitors lived is that we have a truly prodigious supply of energy.

A flood of petroleum, both oil and gas, powers our extraordinary mobility. No matter how much of this irreplaceable, earth-born natural resource we use, there seem to be more exploitable reserves discovered, more than enough to keep the tanks and pipe lines filled to overflowing.

You may be sure that some day, although not in the lifetimes of most of us, there will be a petroleum shortage, and we will have to go to coal, oil shale, or even agricultural crops for our convenient liquid and gaseous energy supplies.

Long before we must turn to these alternates, some of the energy sources that are merely experimental possibilities may come into practical production. There is, of course, atomic energy from fissionable materials, uranium, thorium, and perhaps even other elements whose properties are still wrapped in secrecy. The fusion reaction of the so-called hydrogen bomb may be attainable and controllable, so that power can be obtained from it without destroying a corner of the world.

Man has been envious of the green leaf and its utilization of a biochemical process which he calls photosynthesis. Some have turned to the lowly algae as a prolific crop for capture of sunlight.

A little sunlight has been captured through photoelectric cells and put to almost infinitesimal utilization. Thanks to advanced chemical metallurgy and electronics the capturing of solar energy by physico-chemical means is a little closer to practicality. The solar batteries and similar devices, as described in the leading article in this issue of CHEMISTRY, tell of promising steps in this direction.

As has happened so frequently in the progress of science and technology, we may be on the verge of another power revolution, which we discern dimly because it is so close.

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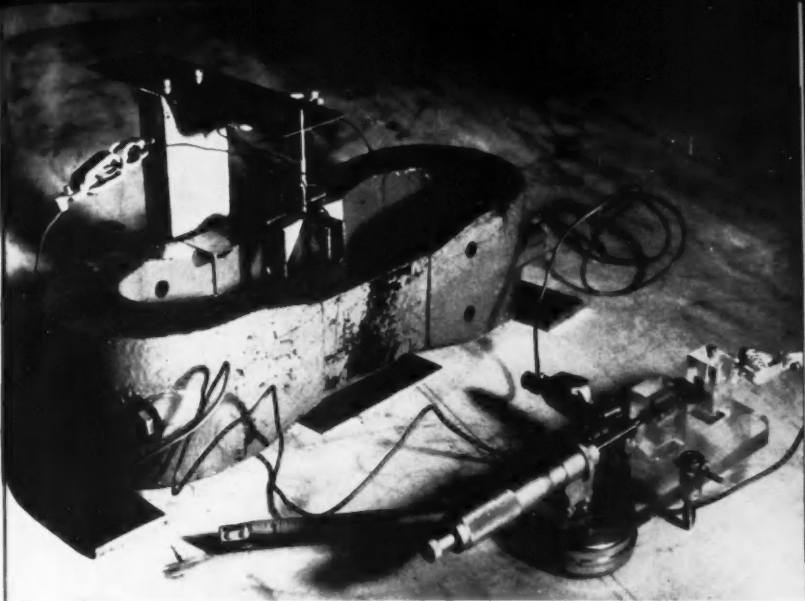


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► ENOUGH electric current to run an electric clock can be drawn from sunlight by action of the small crystal sandwiched between the two pieces of clear plastic at right. In the hookup shown here, sunlight generates one-third of a volt, sufficient to turn the d.c. motor at left at 70 to 80 revolutions a minute. Cadmium sulfide is the crystal in this solar battery developed by the Air Research and Development Command.

Free Solar Power

by HELEN M. DAVIS

► ROOFS, which are large open spaces now used mainly by birds and burglars, may replace furnaces and power plants if a new electricity-generating device works as well full scale size as it does in the laboratory.

Air Force scientists who made the device soldered wires of two different metals, silver and indium, to a crystal of cadmium sulfide. Then they set the crystal in the sun. The crystal picks up energy from the vibrations of the sun's

rays, and delivers enough electric current to run a toy-size motor.

More important, from a practical viewpoint, many such combinations of wires and crystal can be hooked together to combine the electrical effects that each produces. The amount of current measured by scientists of the Air Research and Development Command is proportional to the area of the wire connected to the crystal. With one-eighth square inch contact in their

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experimental model one-third volt electric potential was developed.

Improvements already in sight would increase this voltage six to eight times, for the present set-up. The only limit is that imposed by the size of the pieces of material used, and, when that becomes unwieldy, units may be linked together.

Discoverers of this new way to utilize the energy which comes from the sun are Donald C. Reynolds and Lt. Col. Gerard M. Leies. They were working on the properties of crystals, in a program of study started by Lt. Col. Stanley J. Czyzak, at the Air Force's Wright Air Development Center, near Dayton, Ohio.

Crystals have played an increasingly important part in electrical circuits ever since the early days of radio, when a galena crystal and a cat-whisker wire brought in electric waves of broadcast frequencies. Galena is lead sulfide.

Cadmium sulfide was one of many crystalline substances investigated in the present program. The property studied has to do with the individual qualities of different kinds of matter. When two different materials are brought close together, there is a tendency for electrons to flow from one to the other. If enough electrons flow to constitute an electric current, the device becomes an electric battery. If a current can be drawn continuously, without consuming the source, the apparatus can be called a generator.

But electric energy drawn from a battery or any other source represents a transformation of some other kind of energy. That from an ordinary dry cell or storage battery is the result of

chemical transformations essentially the same as those of corrosion.

The electromotive force inherent in the nature of the two different poles of the battery urges one of the materials into solution. This chemical energy is changed into electrical energy which can be used to light a flashlight or power the self-starter of a car. A tin roof might be fixed up to supply electric power by using this principle, but, after a few rains, the chief result would be a leaky roof.

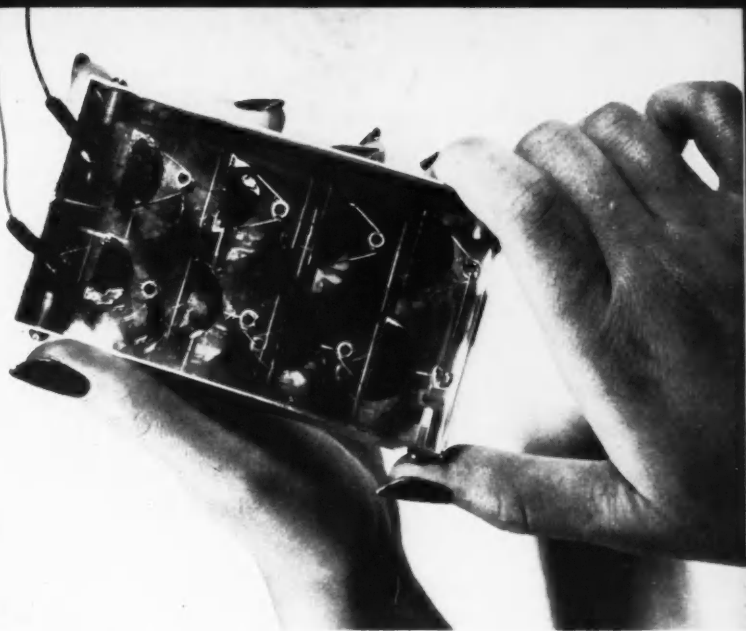
The new solar generator announced by the Air Force operates because of differences between the metals silver and indium and the cadmium sulfide, but the energy it draws on to produce electric current is not chemical energy but the radiant energy of the sun's rays.

A roof covered with cadmium sulfide crystals linked together with wires of indium and silver, and covered with transparent plastic to keep the rain off, may result in great saving on the electric bill, if the predictions of its developers come true. There seems to be no theoretical limit to getting current from this source up to the levels used in everyday household equipment.

The cadmium sulfide solar generator is the newest of a long line of devices to capture the energy of the sun. It is also the newest to operate on the slight differences between similar chemical elements.

Such differences are also utilized in the solar battery recently announced by the Bell Telephone Laboratories, and in the transistor now coming into use in place of the vacuum tube in miniaturized electronic circuits.

The transistor and the solar battery



► THIS SOLAR BATTERY, invented at Bell Telephone Laboratories, is composed of strips of specially prepared silicon. The Bell System envisions its use in telephony, in such equipment as mobile radio-telephone systems and as sun-powered battery-chargers for rural telephone systems. The solar battery was invented by a three-member team of Laboratories scientists, G. L. Pearson, C. S. Fuller and D. M. Chapin.

each employs a triad of three neighboring elements in the chemist's periodic table.

Germanium is the element responsible for the transistor. It is number 32 on the chemist's list. Those on either side of it are gallium, number 31, and arsenic, number 33. Coupled with a small percentage of gallium, the conductivity of germanium seems to be by positive electric charges. If, instead of gallium, a slight amount of arsenic is present in the germanium, the more

usual kind of conductivity by negative charges is observed. This peculiarity of germanium has been known for a long time, and has earned the element the name of a "semi-conductor." But only lately has the explanation for its behavior been found, and the way to use it been devised.

Because germanium is an exceedingly rare element, scientists have spent a good deal of effort to find other sets of elements that would make good transistors. Working with principles of

chemical relationship, they have found that the light elements boron, aluminum and indium, which share the third group with gallium, can take its place to make the positive type of semiconductor with germanium. Similarly, they have found that other fifth group elements, nitrogen, phosphorus and antimony, can exchange places with arsenic to produce the negative type of semiconductor. But only recently have the scientists been successful in finding a substitute for germanium.

Silicon is the logical candidate to take germanium's place as a semiconductor. It is a close chemical relative in the fourth group of elements. But until special methods of purification were successfully worked out, the substitution of abundant silicon for scarce germanium could not be made. Even now, although silicon occurs in the form of its oxide in common sand, the tedious purification process makes silicon for transistors about as expensive as germanium.

Pure silicon containing tiny amounts of carefully controlled impurities is also responsible for the solar battery developed by scientists at Bell Telephone Laboratories. This device absorbs energy when sunlight shines on it, and turns it into electrical energy which the telephone company expects to use as chargers at amplifier stations along rural lines. Small radio transmitters on mobile equipment can also draw their power directly from the sun by using these solar batteries.

The advantage of using free power from heaven is tempered in the case of the transistor by the fact that a minute percentage of impurity is necessary to make it work, but that too much spoils the arrangement. On a

miniature scale, relatively large effects are produced, but voltages and currents comparable to household circuits are out of the question.

But the amount of electricity to be produced by the action of the three-element combination, silver, cadmium, indium, Nos. 47, 48, and 49 in the chemist's table, by the Air Force's solar generator, promises to be much greater. In this device, the transformation of sunlight into electrical energy is accomplished by means of a "barrier-layer cell." Possibly we are only at the beginning of a new era in which little-suspected properties of elements will prove, upon investigation, to have potentialities not now imagined.

Power to help accomplish difficult tasks has not always been the monopoly of large financial interests. The miller who built a wheel to be turned by a small mountain stream, or the householder who erected a windmill, have always drawn on the free supply of energy currently available. The farmer who raised feed for his animals and then employed a horse, a mule or an ox to turn a treadmill which powered a home-made machine was getting mechanical energy at no extra cost.

It is only when fossil fuel stored ages ago is drawn upon that the energy charge goes up. Scientists are worrying now because the supply of fossil fuel is growing short. If increase in the use of it continues at the present rate, their measurements show that it will last less than a century. Some method of using sunshine with relative efficiency is urgently needed. Perhaps the roof will soon be the most valuable part of the house.

Real Atomic Battery Uses Strontium 90

Current From Nuclear Particles

► ATOMIC energy has been converted directly into electricity through a revolutionary atomic battery, using a waste product of atomic reactors.

The waste product is strontium 90 which emits high-speed electrons that bombard pea-sized transistors. The transistors, which are themselves revolutionary in the field of electronics, in turn emit 200,000 slow-moving electrons for each high-speed electron striking the material from the strontium 90.

This creation of electric current is strong enough to produce an audible tone in a telephone receiver.

The Radio Corporation of America battery is thimble-sized and has a life expectancy of 20 years. It is a climax to 40 years of scientific efforts aimed at converting the radiation of the atom's nucleus directly into electricity. The atomic battery development has been termed as great as Edison's, when he converted electricity into light.

Engineers foresee immediate possi-

► A MAGNIFIED MODEL of the two basic elements of the experimental battery that converts atomic energy directly into electrical energy, using a radioactive source placed next to the tiny transistor.



bilities for the revolutionary battery. Its ruggedness, long life and compactness make it especially attractive for use with modern electronic equipment using very small parts.

The battery promises to be useful as the power source in portable pocket-sized radio receivers, hearing aids and signal controls. Eventually, it is believed the battery will be used in portable short-range radio transmitters for radio telegraph and telephone work. It also may go into radio beacons used in air and sea navigation.

Other waste products of atomic reactors are expected to produce atomic batteries as good as the strontium 90 battery which gives an electric output

that far exceeds that of any such attempt made previously.

The development of the atomic battery has been hailed as a significant development in the utilization of atomic energy for peaceful purposes.

Previous attempts to harness the atom to the nation's electric gadgets have been encumbered because the atom's energy could not be transformed directly into electricity. Networks of piping to carry liquid metals through the hot reactor were needed. The heat picked up in the reactor then was released in water to generate steam which in turn drove electric generators.

Coal Pipeline Termed "Promising"

➤ A PIPELINE for transporting coal over long distances has been successfully tested and found promising, George E. MacDonald, New York engineer, told the American Society of Civil Engineers at a recent meeting.

Coal was crushed finely, immersed in water and pumped through the line in tests completed by the Pittsburgh Consolidation Coal Co. It was estimated that such a line linking Cadiz, Ohio, to Lake Erie, more than 100 miles away, might deliver coal \$1.00 a

ton less than the \$2.75 per ton it now costs to ship the fuel the same distance by rail. Mr. MacDonald pointed out that "big-inch" oil pipelines were the engineer's answer to the problem of finding more economical means of mass oil transportation. In their few short years of existence, oil pipelines have probed through the earth until now they form a network of 163,000 miles. Another 10,000 miles are slated to go into operation this year. Pipelines for natural gas also have grown.

On the Back Cover

➤ GERMANIUM comes from the reworking of old mine tailings and deposits of flue dust in abandoned smelters. This pile of tailings from a lead and zinc mine in northeast Oklahoma is typical of the landscape around such a source. Photograph by Helen M. Davis.

Future Atomic Rockets Might be Cooled With Gas

Cooling Atomic Rockets

► FUTURE experiments on a cooling system said to be particularly feasible when nuclear energy is used as the power source for rockets and jet engines were described recently to scientists administering aeronautical research under "Project Squid."

Although applications of the cooling system to atom-powered planes and missiles is still largely speculative, studies on the system already are being conducted by a research team under guidance of Dr. Shao Wen Yuan, associate professor of aeronautical engineering at the Polytechnic Institute of Brooklyn, and continued research was proposed.

The cooling system more immediately might be applied to combating the high heats generated on the wings of supersonic planes due to air friction.

The current and proposed experiments form a part of a project of basic research aimed at turning up more knowledge about jet and rocket engines. Project Squid is sponsored by the Army, Navy and Air Force. It is being administered by Princeton University under a contract with the Office of Naval Research. Subcontracts currently are held by 10 universities, three corporate research laboratories and one government agency.

Dr. Yuan told a gathering of Project Squid scientists that current rocket and jet engine materials will not be able to withstand the terrific heats that

will be generated by better fuels in the future.

Thus, he said, scientists must develop materials that can withstand these heats, or they must learn to keep existing materials cool while the blaze swirls within the combustion chamber.

Dr. Yuan said that a cool gas or liquid can be forced through the walls of combustion chambers made of a porous metal. The coolant absorbs heat from the metal and carries it back to the combustion chamber. It also forms a thin layer around the chamber surface to help keep the metal cool.

Some of the other groups presenting progress reports said that they hope to continue experiments which will help engineers fight "blowouts" in jet engines. When the flame of a jet engine blows out, a pilot can get into serious trouble unless he can relight his engine or find a nearby airport where he can land his craft "deadstick."

Other research conducted under Project Squid auspices includes studies of the heat-conducting and viscous properties of fuels, mixing of subsonic and supersonic gases, vaporization of fuels, chemical reactions in combustion processes, ignition and flame stability, ions in flames and flames fed by oxidizers other than pure oxygen.

Past research of Project Squid has led to the development of new and

better engines now cloaked in security. It is said that German engineers who developed the V-1 and V-2 rocket would scarcely recognize the current

models of these engines.

It is also speculated that some of these new engines will make the dream one-man helicopter come true.

"Canned" Pump For A-Plants

► THE COMPLETE information needed to build a "canned" pump such as is used in atom-powered submarines is now available from the Atomic Energy Commission's Pittsburgh office.

The canned motor pump is abso-

lutely leak proof. It was so designed to protect crewmen aboard the USS Nautilus. Contained in the can is the motor that circulates hot water or liquid metal from the reactor to the boilers and back again. The fluid being pumped lubricates the bearings.



► Looks like he'll beat Chanshaw's record by at least 10 feet!"

Future Medical Cures Outlined by Doctors

Drugs and Antibiotics Fight Disease

► GLIMPSES of future healing and life-saving treatments were shown at the meeting of the American Medical Association in San Francisco. These may be the cures for tomorrow's or next year's patients, though they are now in the experimental and planning stages.

For the war on cancer, chemists have developed and doctors are trying the following: Desoxypyridoxine which is made from vitamin B-6; a British drug called GT 41, or Myleran; a Swiss drug called Demecolcin; and a new U.S. chemical, Thio-Tepa, made by chemists at Lederle Laboratories, Pearl River, N.Y. It is related to the nitrogen mustards which doctors have for some years been using to stave off death temporarily in leukemia patients.

Looking for a better anti-cancer chemical, the Lederle scientists first made Tepa, which showed some promise, and then substituted a sulfur molecule for an oxygen molecule and came up with Thio-Tepa.

This very new compound is showing promise in trials in chronic myelogenous leukemia and also in breast cancer.

Thio-Tepa may also save patients from cancer that has spread to other parts of the body after the original growth in breast or uterus or other organ has been removed.

In such cases surgeons will put the new chemical into the place from

which they have removed the cancer. Because Thio-Tepa, unlike some anti-cancer chemicals, can be applied locally it may be used this way to destroy any cancer cells that might break off and stay in the body when the main cancer is being removed. Such stray lost cancer cells are believed to be a source of recurring cancer or spreading cancer after removal of the original growth.

These new chemical weapons against cancer are still on trial and have not yet effected any cures. But they show that chemical treatment of cancer is valuable and they give promise that still more effective ones will be developed. The new and old and future chemicals for cancer treatment were described to the meeting by Drs. Jerome J. Oleson and James H. Williams of Lederle Laboratories.

Seek Chinks in Resistance

► TUBERCULOSIS, the greatest killer among infectious diseases, might be well on the way to complete eradication if it were not for the speed with which the TB germs develop resistance to streptomycin, isoniazid and other new medicines for tuberculosis.

But tuberculosis has still to be completely wiped out. Penicillin is now useless in about half the cases of staphylococcus, and erythromycin, one of the newest antibiotics, or so-called mold remedies, has already grown useless in about two-thirds of the infections it once stopped completely.

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Looking for chinks or loose blocks in what one scientist calls the "stone wall" of drug resistance by disease germs, workers in many scientific fields conferred at a meeting sponsored by the Office of Naval Research and the University of Pennsylvania.

Use of several drugs at one time in treating patients with germ diseases is one way to lick the problem, in the opinion of Drs. V. Bryson and W. Szybalski of the Long Island Biological Association at Cold Spring Harbor, N.Y.

Development of chemicals that will check genetic changes in disease germs and the induction of resistant cells is another method proposed by these scientists. They see drug resistance as based chiefly on the continuous origin of new, rare types of cells by the process of mutation. This leads to changes in heredity of the germs which is followed by the selection in the presence of the drug of strains of resistant germs.

Differing with these and many other U.S. scientists are Canadian and British workers who see drug resistance as an adaptation of the germs to a new environment caused by drugs, rather than as a mutation and genetic change. Reports to this effect were given by H. B. Newcombe of Canada's Chalk River Atomic Energy Project, Dr. A. C. R. Dean of Oxford University, England, and Prof. C. P. Martin of McGill University, Montreal, Can.

Give Good Results in TB

► TWO NEW DRUGS for treatment of tuberculosis were announced at the meeting of the American College of Chest Physicians.

One, called streptoduocin, is made

of equal parts of two older anti-TB drugs, streptomycin and dihydrostreptomycin. In trials at the Philadelphia General Hospital all patients could take it without toxic effects and with typical good results in stopping the disease. Many of the patients had previously had large doses of streptomycin or dihydrostreptomycin alone, and many had shown signs of damage to the hearing nerve or to the inner ear or both. The good results with streptoduocin were reported by Drs. Harry Shubin, Charles A. Heiken, Allen Glaskin, Edward Pennes, Sushil Chakravarty and Franklin Rutberg of Philadelphia.

The other new anti-TB drug is Salizid. It is chemically similar to isoniazid. When tried in patients it seemed as effective as isoniazid. Nerve damage following its use is unusual, reported Drs. Sol Katz, Georges F. McCormick, Patrick B. Storey, Angel de Leon, Monroe J. Romansky and Edward E. Marshall Jr. of Washington, D.C. Occasionally, they reported, Salizid was effective in patients who were no longer helped by isoniazid.

Antibiotic Ointment

► AN OINTMENT containing the antibiotic, neomycin, can clear up stubborn cases of impetigo within three weeks, usually less, Dr. Ronald Church of the Royal Infirmary, Sheffield, England, has found.

He recommends use of the ointment as routine treatment for this unsightly and very contagious skin disease. Of 45 cases of contagious impetigo treated with the neomycin ointment, Dr. Church found that half were cleared in less than one week. All were quite healed in less than three weeks.

Dr. Church favors the neomycin ointment over other major antibiotics in order to avoid allergic reactions in the patient and to dodge the development of drug resistance by the germs.

Neomycin, manufactured by the Upjohn Company under the trade name, Myciguent, was discovered in 1949 by Dr. Selman Waksman. At that time, it gave promise of becoming an effective drug for treating tuberculosis. Although physicians later found it unsuited for use against TB, they realized it might be useful against infections of the skin, eyes and intestinal tract.

In 31 of the cases treated by Dr. Church, treatment with other antibiotics had failed to clear the impetigo.

Blood Expander From Earth

► FROM THE EARTH, source of many antibiotic remedies, scientists have now dug up a microbe, or germ in lay language, which gives a promising blood plasma expander for treating burn shocked patients.

The particular microbe is called *Bacillus subtilis*. The plasma expander that comes from it is called a "cross-linked glutamyl polypeptide." This substance is reported 10 times more effective than serum albumin of blood at attracting water into the blood stream.

Development of this blood plasma expander from the soil bacillus was achieved by Dr. Max Bovarnick of the Veterans Administration, now stationed at the VA Hospital, Brooklyn, N.Y.

Simultaneously with announcement of this achievement, two other government scientists, Drs. Curtis B. Thorne and Riley Housewright of the Army

Chemical Corps Biology Laboratory, Camp Detrick, Md., reported a method for growing the soil bacillus in large quantities so that low cost production of the new plasma expander will be possible.

The *subtilis* bacillus does not yield the plasma expander directly. What it yields when grown on suitable medium is a simple straight chain peptide. Peptides are derived from proteins and are made up of two or more amino acids, commonly called protein building blocks.

The straight chain peptide from the *subtilis* microbe is a slender rod-like molecule which slips out of the blood vessels too fast to be useful long enough as a plasma expander.

Dr. Bovarnick solved this problem by changing the simple peptide into the cross-linked glutamyl polypeptide which has molecules shaped more like a Christmas tree and of the right size for staying in the blood stream long enough.

Tests on laboratory animals and humans so far show the new plasma expander can safely be injected into the blood stream and stays there long enough so that its blood expanding property should see the patient through the emergency period after severe burns or other wounds, just as blood or plasma would.

After it has served its purpose in the blood stream, it is broken down by the body and then used in part by body tissues as food and in part excreted.

Next step on Dr. Bovarnick's program is to tag the expander with a radioactive chemical to learn exactly what becomes of it in the body.

The new expander can be sterilized by steam under pressure, does not form a jelly at freezing temperatures and can be stored without loss of potency for practically indefinite periods in either the dry state or in solution.

The molecule size and shape can be changed without reducing the expander's efficiency. This means that different preparations of the substance

could be made and the doctor treating a patient could select one that would stay in the blood for a few minutes or for hours, as needed.

Collaborating with Dr. Bovarnick and his VA associates, Drs. Bruce Kessler and Daniel O'Connell, have been researchers at the Merck Institute of Therapeutic Research, Rahway, N.J., where the microbe was grown and much of the animal work done.

Stinkometer Tells Quality of Fish

➤ A SCIENTIFIC "sniffer" which may be able to determine precisely the quality of food by its odor is being developed by scientists at the University of California.

Fine grading of such foods as fish, vegetables, fruit, cheese, butter, coffee, spices, pepper, etc., may one day be done by this laboratory "nose." Farmers might even use it to tell the best time to pick fruit for eating or for canning.

The instrument is an outgrowth of research by Dr. Lionel Farber for the better detection of fish spoilage. Dr. Farber started out with the idea of finding something to detect incipient fish spoilage before it became apparent to that oldest and most reliable odor testing instrument—the human nose.

The nose can not pick up some of the volatile substances in the early stages of spoilage. Moreover, personal opinion, odor sensitivity and other factors make the nose imprecise.

Dr. Farber came up with a simple thing called the "stinkometer." He passes clear air through a food sample and then into a vessel containing per-

manganate, which has a magenta color.

If the food is spoiled, the magenta color changes. Depending on the quantity of odor, the magenta goes to blue, gray blue, green blue, green, and—in the worst cases—pale green. The final color shows the degree of spoilage.

The test is simple, quick and inexpensive for fish spoilage.

Dr. Farber noted that the "stinkometer" does not care whether the odor is good or bad. It just shows how much there is. So he began using it to test for quality.

The quality of coffee, for example, can be measured by the amount of aroma it has left. The "stinkometer" can tell. Some cheeses need to have a lot of aroma—and the scientific "nose" tells how much.

Dr. Farber says the test is capable of detecting all the known volatile substances involved in odor. Chemical tests have been used, but they are sometimes complex and none picks up all the substances involved, he said.

He predicted that with competition sharpening, commercial concerns may find advantages to such a simple test for quality of food products.

Are Chemicals in Foods Lessening Life Expectancy?

Are We Poisoning Ourselves?

► WILL today's generation of young adults find, when they reach the 50- to 70-age bracket, that they have been slowly poisoning themselves and cutting one to five years off their lives because of the food they have eaten?

There are some who fear this may be the case. Others are quite confident that the suggested dangers are exaggerated.

We are living in a chemical age. We use new and powerful poisons in our fight against the insect world. We use new chemicals to preserve or to improve the quality of our food. We use new chemicals to keep our clothes and homes clean and to wash our eating utensils and ourselves. Many of the clothes we wear and the things we use and handle daily are the products of chemical laboratories and manufacturing plants.

Our doctors even have a kind of synthetic chemical fluid to put in our veins instead of blood in some emergencies.

Many, probably most of these new chemicals and chemical products are given rigorous safety tests before they are let loose among us. We have laws, federal and state and even city ordinances, protecting us from much of the danger.

But there are two limits to the protection such laws and tests can give us: 1. The carelessness of each individual who uses a substance known to be potentially dangerous; 2. Ignorance, unavoidable for the most part so far,

of the long-time effect of some chemicals.

Take, as an example of this last, one of the new chemicals developed as a blood extender for use in treating shock if whole blood or plasma is not available. This chemical is polyvinyl pyrrolidone, or PVP for short. It was developed and used in Germany during World War II. It has had extensive tests since then in this country. No adverse effects have been reported. But this chemical after a time leaves the blood stream and some of it deposits in the liver and spleen. It stays there without showing any sign of setting up inflammation or other trouble—so far. Whether it will stay there, unchanged and without causing damage, for 20 or 30 years is a still unanswered question. Because that question has not yet been answered, our federal Food and Drug Administration has refused to allow it to go on the general market. In technically correct terms, PVP does not yet have an effective new drug application.

Congress has been considering a bill to give the Health-Education-Welfare Secretary, (actually the Food and Drug Administration in that department) authority to determine how much insect-killing chemicals can be left on fruits and vegetables when they go to market.

These chemicals, known as insecticides or as pesticides, include some highly poisonous substances. One of these, parathion, is related to the

much-dreaded nerve gases developed for war use. But even with legal limits, "tolerances" as they are called technically, set for the amount of these chemicals that can be left on foods shipped in interstate commerce, the consumer may be exposed to danger from them right in his own or his neighbor's garden.

Home gardeners as well as farmers use these sprays to protect their fruits and vegetables from insects and other pests. Many farmers sell some of their products at roadside stands and in farmers' markets on the outskirts of our cities. Since these fruits and vegetables are not shipped in interstate commerce, they, like the home grown ones, are not subject to federal protecting laws. They may or may not come into your home with spray residue still on them.

Here is where the individual consumer comes in. He can protect himself by the simple method of washing all fruits and vegetables before eating

them. Washing or spraying with water will remove any spray residue. Even if there were no spray residue, washing fruits and vegetables before eating is a good idea, since the washing removes dust, fly specks and the like.

The individual consumer needs to do a little self-protecting in still another way. When using insecticides and pesticides in the garden, he should read carefully the manufacturer's label and follow the instructions on it for avoiding any poisonous effect on people and domestic animals including pets. A good idea is to read the instructions and warnings every time the insecticide is used, to make sure you have not forgotten some important point.

This goes for both garden sprays and the insecticide sprays used to rid the house of flies, roaches, ants and the like. It applies also to cleansing agents, rust removers and all the other chemical aids to daily living.

Sheep Diet Affects Wool Strength

► SUCH PHYSICAL properties of wool fibers as strength and stretchability can be changed by changing the sheep's diet, Drs. G. L. Clark and V. E. Buhrke of the University of Illinois have discovered.

Adding sulfur to the sheep's diet, for example, changes the rate at which a fiber that has been stretched goes back to its original size.

Using radioactive sulfur as a tracer, scientists had previously found that sulfur in the diet of sheep gets into

body chemical reactions and appears in the wool within two weeks.

In new tests the Illinois scientists found that as sulfur is added to the sheep's diet, there is a greater tendency for stretched wool fibers to keep their extended configuration and to resist relaxation after stretching is stopped.

Whether or not adding sulfur to the sheep's diet would produce more satisfactory wool for suits and coats, the finding that changes of the diet produce physical and chemical changes in the wool is considered significant.

Thousands to Leave Mental Hospitals. New Medicine Promises

Chemicals Treat Mental Sickness

by JANE STAFFORD

► A CHEMICAL saves men's minds, as sulfa drugs and antibiotics save men's lives. The fight against mental disease through therapy with chemicals is gaining.

A prediction that thousands of institutionalized mental patients will be able to return to their homes, families and jobs has been made on the basis of results so far with one promising new medicine.

This medicine is called Serpasil. It has been on trial at Modesto, Calif., State Hospital. Out of 73 patients treated, 20 have lost all symptoms and eight have been discharged. Dr. Robert Noce, director of that hospital's clinical services, reported these results at a recent meeting in New York. From the Modesto experience, he believes every type of the mentally ill can be helped, even some of the mentally retarded.

Changes in brain wave tracings back up the doctors' observations that the personalities of the patients are undergoing a basic reorganization.

But Serpasil, derived from the snake-like root of an Indian plant and manufactured by Ciba Pharmaceutical Products Company, Summit, N.J., is only the latest development announced in the now promising chemical attack on mental sickness.

Equally good results were announced earlier for another drug, chlorpromazine, and shortly before

that a hormone treatment for mental disease was proposed on the basis of this hormone's chemical and physiological characteristics.

Mental patients in the severely excited, or manic, phase of their illness can be quickly quieted and sometimes improved enough to leave the hospital by the drug, chlorpromazine, Drs. H. E. Lehmann and G. E. Hanrahan of Verdun Protestant Hospital, Montreal, Canada, reported to the American Medical Association's Archives of Neurology and Psychiatry.

The drug was first announced as effective for stopping nausea and vomiting. At that time sedation, or a quieting action, was reported as a side-effect.

The drug was used for its quieting effect on 71 psychiatric patients aged 18 to 82 years over a period of four months. The Montreal doctors report that it arrested imminent psychotic attacks in four patients, affected recovery and sustained cessation of symptoms in 13 patients, reduced symptoms to the point where patients were able to leave the hospital in seven cases, lessened the symptoms of 27 patients, and failed to cause any improvement in 12 patients. Eight of the patients were still under treatment at the time the report was made.

The drug is of unique value in the symptomatic control of almost any kind of severe excitement, the doctors

pointed out. It has pronounced effect on the central nervous system.

"We are particularly impressed with the favorable results in our manic-depressive patients in a chronic manic state, all of whom had been continuously manic or hypomanic for more than a year and had previously failed to respond to standard therapeutic procedures or had had only brief remissions," the Montreal doctors stated.

"Psychomotor excitement is usually reduced significantly within 24 hours, and sleep at night is often restored within the same period. Feeding problems disappear rapidly, and the patient soon becomes cooperative to nursing care. The psychiatrist is surprised to find his manic patient amenable to reason. In acute manic states, chlorpromazine therapy usually leads to recovery in a shorter time than is required with other, established treatment procedures."

The drug should not, the doctors warned, be expected to act as a cure-all in mental sickness. If the factors in the environment and the conflicts that have caused the sickness cannot be removed or worked out, the drug can only be considered an aid to psychiatric treatment.

The new hormone treatment for serious mental diseases such as schizophrenia was proposed at the National Academy of Sciences meeting in Washington last spring by Drs. D. W. Woolley and E. Shaw of the Rockefeller Institute for Medical Research, New York.

The hormone would be serotonin or a close chemical relative of it. Lack of serotonin in the brain may be the cause of mental disorders, much as

lack of another hormone, insulin, results in diabetes.

The idea that serotonin may play a role in certain mental processes came to the Rockefeller scientists through study of a variety of antiserotonins. The antiserotonins include drugs that cause mental aberrations, for example, an ergot alkaloid, another plant drug called harmaline, yohimbine and a synthetic chemical, medmain.

Serotonin is a natural body chemical found in blood serum. The Rockefeller scientists also found it in the brain. This suggested that the mental changes caused by the antiserotonin drugs resulted from a deficiency of serotonin in the brain. The deficiency would result from the drug countering or blocking the effect of serotonin itself.

The naturally occurring mental disorders such as schizophrenia are mimicked by the antiserotonin drugs. They may therefore also result from a serotonin deficiency in the brain. So the remedy for such mental disorders might be treatment with serotonin.

The Rockefeller scientists urged psychiatrists to apply these findings to see whether this hormone attack might conquer mental disease.

Serotonin itself may not be the actual remedy that would be tried because it may not be able to get from the blood stream into the brain tissue. In mice, the Rockefeller scientists found, it could not penetrate this blood-brain barrier. A serotonin-like compound may have to be found or synthesized.

Where serotonin is made in the body, and what its exact role is in body functioning, are not known. It can

contract muscles of the kind called smooth, which are not under voluntary control. It constricts small blood vessels and therefore has an effect on blood pressure. It is said to be twice as powerful as adrenalin for fighting shock.

It was isolated from blood platelets in 1948, though only a pinch of it could be got from a very large quantity of blood. It has since been made synthetically and is known chemically as 5-hydroxytryptamine.

The modern chemical attack on mental sickness got its start about 20 years ago when metrazol and insulin were first used. Doctors were greatly heartened then because they saw apparently hopeless patients restored to sanity and because the treatments seemed to show mental sickness might after all be a matter of body chemistry and therefore susceptible to rational treatment through chemistry.

But metrazol and insulin seemed to act through the terrific jolt, or shock, they give the patients. Treatment swung quickly to shock methods with electric currents used instead of chemicals.

The new medicines swing back to a much older approach, that of quieting and soothing the disturbed mind.

Chlorpromazine and serpasil both are sedatives. In fact, when chlorpromazine was first brought out by Smith, Kline and French of Philadelphia in 1953, its quieting action was noted as a side effect. Interest then was on its ability to stop nausea and vomiting. But when Montreal doctors began using it to quiet severely excited mental patients, they found it not only quieted the patients but brought about recovery and sustained

absence of symptoms in 13 of 71. In seven cases patients were able to leave the hospital and in another 27 symptoms were lessened.

Serpasil also was first reported in connection with non-mental disease patients. It was believed valuable for high blood pressure sufferers because of its soothing effect. The soothing quality had a remarkable effect on the Modesto Hospital violent patients but in addition the drug showed more remedial effect on the illness itself.

These drugs may not stand the test of time as remedies for mental disease. Some scientists will see more promise in the proposed use of the hormone chemical, serotonin.

A similar approach to the problem of mental sickness comes from research by Boston scientists. They find they can bring on mental aberrations mimicking mental disease by a chemical called d-lysergic acid, or LSD for short. This chemical could be made in the body by faulty breakdown of adrenalin, hormone poured out by the adrenal glands when a person is faced with danger or in a stressful situation. This may be the link in the long-suspected relation between the adrenal glands, stress and mental disease.

From these many and diverse approaches, the hoped-for chemical cure for insanity may be coming.

For High Blood Pressure

► DOCTORS now have a double drug for treating patients with high blood pressure, or hypertension. The double drug combines two anti-hypertension drugs, serpasil and apresoline.

Apresoline is a phthalazine derivative. It has given good results in moderate and severe hypertension. Serpasil is derived from the root of an Indian

plant and is noted for its quieting effect which it produces without causing heavy drowsiness.

Doctors have been using both drugs, alone and together, for about a year. Results were often better together than from either one alone. So Ciba Pharmaceutical Products markets them combined in one drug so that patients do not have to take doses of each.

Test For Mental Patients

► STATISTICS showing that the outcome of treatment for mental patients can be predicted by the simple Funkenstein pre-treatment test were reported by Dr. Leo Alexander of Boston State Hospital and Tufts College Medical School, Boston, at a meeting of the American Psychiatric Association.

The test is made by injecting adrenalin into the veins and another chemical, mecholyl, into the muscles.

Those patients whose blood pressure

response to mecholyl is greater than normal have a greater potential for recovery. And their chance for recovery after treatment is in direct proportion to the degree of over-reaction to the drug.

Chances for recovery are least good, Dr. Alexander found, in those patients whose blood pressure response to adrenalin is lower than normal.

The test also points to the kind of treatment likely to be effective in particular patients. For example, patients whose blood pressure response to mecholyl is exaggerated respond well to electroshock treatment. Those whose response to adrenalin is below par do not improve on electroshock treatment.

Insulin shock treatment, on the other hand, proved best adapted to patients who became over-anxious in response to the adrenalin test.

Gypsum For Salt in Cattle Feed

► GYPSUM is being substituted for salt in mixtures with cottonseed meal for self-feeding to range cattle in experiments at the San Joaquin Experimental Range of the University of California.

Kenneth A. Wagnon, associate specialist in animal husbandry, is directing the experiment. Gypsum, calcium sulfate, is cheaper than salt and easier to mix with feed concentrates because it does not harden in storage.

Mr. Wagnon has found that less gypsum than salt is needed to curb the amounts of concentrates eaten by

cattle from self-feeders. Daily consumption of two pounds of gypsum per animal has shown no ill effects.

The daily intake of the animals varied with changing forage conditions and with different aged animals, he discovered. Mr. Wagnon hopes that the experiment will show that gypsum is less hazardous than salt to cattle on ranges where water is not abundant.

The tests are still in the experimental stage and no general recommendation to livestock growers has been made.

By weight, more wood is used as raw material than any other material except coal.

Bone Test Clues to Need For Better Diet

Bone Calcium Measures Health

► THE DAY is coming when doctors will make a test of your bones to see whether your diet needs improving, just as they now test a drop of blood from your finger or ear to see whether or not you are anemic.

This is foreseen from research by Dr. Walter N. Brown Jr., at Pennsylvania State University, at State College, Pa. Sparked by an idea of a former professor, Dr. Pauline Beery Mack*, now at Texas State College for Women, Denton, Tex., Dr. Brown developed a machine known as the bone density computer.

Besides showing up nutritional deficiencies, the machine is expected to tell physicians how quickly a broken bone is knitting and to help in the fight against polio and arthritis.

"Measuring bone density," Dr. Brown explains, "involves measuring the amount of calcium in a bone. We first had to learn how to do this technically. That work, which took several years, led to the development of the computer. Now we are ready to start large scale measuring experiments."

Such experiments involve the cooperation of physicians and organizations throughout the country, who will take special X-ray films. Regular equipment is used, but an aluminum-zinc alloy wedge is sent to help standardize film conditions.

When a picture is taken, Dr. Brown

says, the bone absorbs X-rays, and where it absorbs them, the film registers clearer. That means the more transparent the film is, the denser the bone is. Accordingly, we use film transparency to help tell us about bone density.

But any number of factors can affect the film itself. Different X-ray machines blacken film to a different extent. Film is manufactured by many methods and variations occur because of this, as well as when it is being developed.

The wedge, however, is not subject to these variables. By laying it alongside the bone to be X-rayed, a constant standard is established, against which film variables may be checked in the computer.

The bone density computer finds the density of bone for each tiny area of the X-ray film, by comparing these areas with the wedge picture. It then averages all the spots together to get the density of the desired section of bone.

The bone density technique is set up to handle only extremity bones in the hands and feet. University scientists are now trying to develop a machine which will find the density of bones inside the body, like the spine or pelvis, or the skull, which are surrounded by areas of soft tissue.

Once films have been taken, they are sent back to Penn State's lab, to

* Dr. Pauline Berry Mack is the founder and first editor of CHEMISTRY Magazine.

be put through the computer. A report is then sent to the physician. With one shift of operators working, the machine will produce some 3,000 films a month.

Two experiments are currently being run, Dr. Brown says. One is with a mixed age group, under the auspices of a nutritional organization in eight western states. The other is in a Philadelphia home for the aged.

We hope to get a series of bone density measurements on the same indi-

viduals. From these, we may learn whether the amount of minerals or calcium in the bones varies as a person grows older, when he changes locale, or when his diet is altered. If such changes can be verified, they would be important for medical researchers.

Some day, he adds, we hope to see computing centers all over the country where physicians will send X-ray films to check on bone densities. In the meanwhile, we're going to do everything we can to develop the technique.

Night Glowing Clothing

► CLOTHING that glows in the dark is one of the finest developments for pedestrian safety in recent years, the Iowa State College Driving Laboratory has determined.

All parents should investigate night glowing materials for their children's protection, Dr. A. R. Lauer, professor of psychology and director of the Laboratory, declares.

Materials are now available for clothing use which reflect 150 times as much light as a white painted surface.

Visibility is the one factor that stands out above everything else in pedestrian deaths, Dr. Lauer said. No driver with his car under control will hit a person on the road he sees clearly and in sufficient time to stop or dodge him.

Collars, yokes, cuffs, glove backs, badges, monograms and other markers can be woven into, sewn on or attached by adhesive to clothing which makes a person very conspicuous to

the driver at night if any light at all is falling on him from the headlight beam.

The colors in daylight vary in shades from navy blue down to yellow. The reflectorized material as such is hardly visible in daylight but at night shows up with dazzling brilliancy.

One manufacturer is making stocking caps that shine like reflectorized signs and can be seen at a much greater distance than even white clothing.

Even during the lessened hours of darkness in spring and summer, approximately one-third of pedestrian fatalities occur in darkness.

It has long been known that pedestrian deaths increase sharply as hours of darkness increase in the fall. In 1953, 53% of urban fatal accidents involved pedestrians. Even in rural areas 13% of fatal accidents involved pedestrians. For November, January and February about two-thirds of pedestrian deaths occurred at night.

Around 1900 there were 210 commercial chemicals on the market; now there are over 6,000.

Chiggers Can Be Repelled From You and Your Yard

New Insect Repellents Help

► REPELLENTS and insecticides can rid you or your whole yard of chiggers and other biting pests.

For the individual, repellents containing dimethyl phthalate, indalone or ethyl hexanediol are nearly 100% effective when applied properly.

Dimethyl phthalate and indalone are available at chemical firms for mixing by the user.

Ethyl hexanediol is used in various commercial products. It is available at most drug stores in liquid form under the name "6-12." A body spray, "Repel A-Mist," and a stick, "Skeeto-Go," also contain the chemical.

For most effective protection against chiggers these products should be applied to skin or clothing around sock tops, trouser cuffs and waist, and shirt sleeves and neck.

Spread on exposed skin, the three chemicals afford protection from flying insects such as mosquitoes, biting flies, gnats, and some types of ticks.

In an open area, toxaphene or chlordane applied to grass and bushes as an emulsion spray will provide good insect control for one or two months. These chemicals are sold at hardware and garden stores under a variety of commercial names.

Do not use these insecticides near fruit or vegetable gardens. Children and pets must be kept from the area until the spray dries.

Before the Second World War, there was little protection from chig-

gers. Sulfur dusts and ointments were messy and only partially effective.

However, when the fighting began in the Pacific, and U.S. troops were attacked by chiggers carrying mite typhus, the Army allotted funds for chigger study to the U.S. Agriculture Department's laboratory in Orlando, Florida.

The Orlando scientists hired young boys to test various chemicals for effectiveness in repelling the tiny insect foe.

The boys, each with clothing treated with a different chemical, placed themselves in areas where chiggers were numerous. The fewer bites on a boy, the more effective the repellent was judged.

Within two hours, the boys often collected 200 bites. They suffered no more than a few days' itching, however. Unlike the insects' Pacific brothers and their cousins, the ticks, chiggers in the United States carry no diseases.

Many of the modern repellents and insecticides on today's market are the results of these boys' itching for science.

The chigger, often called jigger or red-bug, is found in areas throughout the country, but most thickly in southern, central, and Midwestern states.

When a larva, the chigger needs blood to mature. It attaches itself to a human or other mammal. In a human, it crawls until tight clothing restricts

its movement and then bores into the skin.

Since the parasite is no bigger than a pin-point, its victim does not know of the attack until itching begins. Then red bites are visible clustered in rings around belt-line and sock tops.

The bites cause a severe itching that last several days. Calamine lotion, baking soda and water, and ammonia may help relieve the itching somewhat.

The only real "cure" for chigger bites, however, is not to get bitten.

Chicks Given Antibiotic Need Vitamin K

► POULTRY RAISERS feeding their chicks some of the newer growth stimulators and disease-fighting chemicals should also give the chicks some vitamin K to prevent bleeding.

Vitamin K is necessary for normal blood clotting. Chicks synthesize it in their intestinal tract. But chicks fed on modern rations have been turning up with hemorrhages under the skin, sign of vitamin K deficiency, as early as three weeks after hatching.

Scientists at the University of Illinois and the Agricultural Experiment Station at Urbana tested various chick diet supplements and found that terramycin and arsonic acid prolonged the blood clotting time significantly and

that arsanilic acid might do so.

The exact mechanism is not yet known but these supplements could act either by affecting the bacteria that synthesize vitamin K in the intestinal tract or by acting as antagonists to it.

The use of greater amounts of solvent extracted soybean meal and lesser amounts of alfalfa would, the scientists point out, tend to reduce the amount of vitamin K in the chick's ration. At the same time growth stimulants and other drugs affect the vitamin K the chick normally synthesizes.

The experiments are reported by Drs. P. Griminger, H. Fisher, W. D. Morrison, J. M. Snyder and H. M. Scott in the journal, *Science*.

Cancer Cells Grow Polio Viruses

► HUMAN cancer cells removed from the body make good material for growing and breeding human polio viruses in the laboratory. In the course of their growth, the polio viruses completely destroy the cancer cells.

These findings are from studies by Drs. George O. Gey and F. B. Bang, Mrs. Margaret Gey and Max Stohler

of the Johns Hopkins University, Baltimore, and Drs. William F. Scherer and Jerome T. Sylverton of the University of Minnesota. The studies are reported by the American Cancer Society, which helped support the cancer research. The National Foundation for Infantile Paralysis and the U.S. National Cancer Institute also helped finance the studies.

Aluminum and other metals can be used as substitutes for copper with actual savings in the manufacture of many products.

New Furnace Turns Out High-Purity Titanium

Titanium Finds New Uses

► **BETTER**, cheaper titanium for tomorrow's airplanes now is being turned out in a new electric furnace that melts ingots of the lightweight "wonder metal" in a vacuum.

The Titanium Metals Corporation of America has found that their new furnace has improved the quality of titanium melted in it. Company officials ascribe the improvement to the fact that more hydrogen is extracted from the titanium ingot when it is melted in a vacuum than when it is melted in an artificial atmosphere of argon.

Hydrogen, it has been found, is more detrimental to titanium's high-strength, heat-resistant qualities than has been previously thought.

The vacuum technique also fosters more stable electric arcs, larger power inputs and the production of smooth ingots requiring little or no conditioning before they are converted into sheet metal for airplane frames.

For Turbine Blades

► **PROTOTYPE** turbine blades forged of a titanium alloy have been produced for a jet engine to power Canada's CF-105, a new fighter plane designed to fly a supersonic 1,200 miles an hour.

Believed to be the first such blades in the world, they were pressed from dies by Canadian Steel Improvements Ltd., for A. V. Roe Canada Ltd.

Tests with titanium alloy blades at high temperatures and under high

spinning stresses left them unchanged in shape. They did not corrode or otherwise break down at increasing speeds.

The forgings are also of such accuracy that only the leading edges of the blade and the blade root need any machining, except for overall polishing.

The titanium blades promise more powerful jet engines in the future. The lightness of the titanium metal is also important in the development of larger jet powerplants.

Titanium Kitchen Enamel

► **TOUGH** flexible enamel made of titanium dioxide is going into service upon kitchenware as the result of extended research by the University of Illinois Department of Ceramic Engineering.

Use of this porcelain enamel 8/1,000 of an inch thick instead of 20/1,000 of an inch thick as on older coatings will make it resistant to bumps and bangs. The metal with the thin new enamel coat can be bent back and forth without breaking the glass finish.

The new titanium enamel has been used previously upon refrigerators, stoves, and other large objects and replaces the antimony and zirconium types of earlier years.

A group of porcelain enamel concerns that provide the ground-up "frit" which is the material used in the enamel, cooperated in the research. It was conducted by Drs. Arthur L. Friedberg and F. A. Petersen.

Chemical Evidence About Earth's Nearest Neighbor

Mars' Surface Studied as Planet Nears

► IF THERE HAD been intelligent life on Mars peering at the earth through telescopes, last spring's hydrogen bomb explosion could have been spotted.

From the red planet, it would have appeared suddenly as an increasingly large cloud spot mushrooming out, then dissipating, says Dr. E. C. Slipher of the Lowell Observatory, Flagstaff, Ariz. The cloud's mushroom shape and the flash probably could not be seen.

However, scientists attending a recent meeting of the International Mars Committee did not hold much hope of intelligent life on Mars. It would be a startling enough discovery, Dr. Harold Urey of the University of Chicago pointed out, to find positive proof of life on Mars, not human life but plant life such as mosses and lichens.

This would mean, he said, that life appears wherever conditions are "right," and that life on earth is not unique. If plant life is definitely found to exist on Mars, then chances are good for higher forms of life on other planets revolving around other stars, or suns.

Most astronomers now agree that the seasonal color changes seen on the Martian surface are probably due to vegetation, but this is only a "logical supposition," which they hoped to prove this summer when the red planet approached within 40,000,000 miles of the earth.

Finding the particular spectrum line made by chlorophyll, the green pig-

ment of earth plants, would be the most likely proof, Dr. Slipher said. In the case of such a discovery, he promised world-wide notification "within five minutes."

Dr. Slipher went to South Africa last April 3 for a nine-months photographic investigation of Mars using the 27-inch refracting telescope of the Lamont Hussey Observatory at Bloemfontein. The expedition is sponsored jointly by Lowell Observatory and the National Geographic Society.

Studies being conducted by the International Mars Committee at 17 astronomical observatories around the world could furnish a guidebook for future visitors to the red planet, if anyone gathered all the results and put them together, Dr. Slipher said.

A continuous watch was kept on Mars by the 17 observatories, aided by amateur astronomers, during June and July, the months of closest approach. Although from the Northern Hemisphere, Mars was near the horizon and not in a good viewing position, even the giant 200-inch Hale telescope atop Mt. Palomar in California was turned occasionally from far-away galaxies to the earth's neighbor planet.

One aim of the continuous scrutiny was to spot changes in the cloud formations that, rarely, are found crossing the planet's surface. From these observations, the scientists hope to learn more about the earth's atmosphere and weather, since the earth is buried under its ocean of air, whereas

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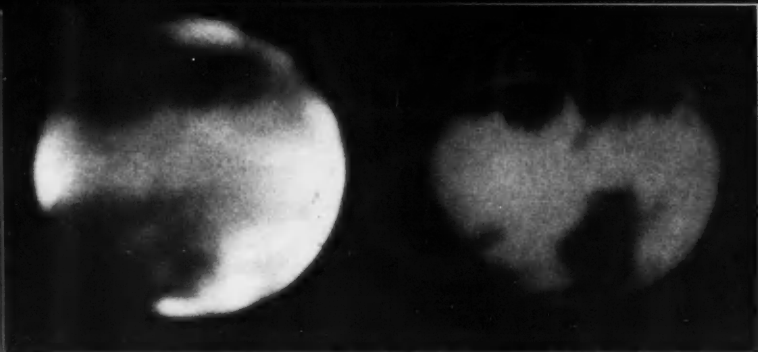
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► **THE PLANET MARS** as photographed with the giant 200-inch Hale telescope atop Mt. Palomar in California. Atmospheric conditions, and clouds or haze, are shown in the left photograph, taken with a plate especially sensitive to blue light. At the top and bottom are the polar caps, which appear in the fall season and disappear in the Martian spring. The right photograph, taken through a red filter on a red-sensitive plate, shows the permanent surface features of Mars. The large dark areas were mapped by the earliest visual observers and are well known.

Martian atmosphere can be viewed from the top.

Meteorologists would get useful information about the earth's weather if the Martian search yielded direct evidence on how solar radiation affected the red planet's atmosphere.

Another aim of the observations, particularly at the South African station, is to make a direct measurement of the diameter of Mars. Knowing this, astronomers could solve the riddle of the planet's composition, using a well-known formula that links the mass, speed of rotation, density and polar flattening of any planet with its radius.

Scientists now suspect that Mars, unlike the earth, does not have a dense iron core, but that it is made up of a uniformly distributed mass of iron and rocks. If its diameter proves to be what it is now thought, just over 4,200 miles across, then theories of the

origin of the planets and of the solar system will have to be revised, Dr. Urey stated. For this would show that the planet could never have been a fiery mass of molten chemicals, as most scientists now believe the earth was.

Bounce Radio From Mars

► **THE UNITED STATES** could bounce radio waves off the sun, Mars and other planets if it set up a large radio astronomy observatory.

Plans for such an observatory are now being discussed. Decisions as to where it would be built, how it would be financed, what it could accomplish are expected within a year. Scientists are now excitedly arguing about what equipment would be best to expand man's knowledge of the solar system and the universe by radio astronomy.

Sensitive receivers here on earth can pick up noises in the radio wave range continuously being broadcast from the

heavens. The sun is the nearest source of such cosmic noise, but far-away galaxies also are sending out radio waves, as is the neutral hydrogen sparsely scattered through space.

Different kinds of equipment are needed to catch the various kinds of radio waves.

British astronomers, for instance, are planning to use their 250-foot dish, now being completed at Manchester, England, to bounce radio waves off the sun. They hope to learn much more about its atmosphere. To get the sharpest focus, they want to use the shortest possible wave-lengths, but interference from the edges of the dish impose a lower limit.

Dr. Lloyd V. Berkner, president of Associated Universities, Inc., which operates Brookhaven National Laboratories, Upton, N.Y., told Science Service that he and Dr. R. M. Emberson are calculating what kind of equipment would be needed to bounce radio waves off Mars and the other planets.

Scientists have succeeded in sending radio waves to the moon, then catching the signals reflected from the moon's surface. They have even speculated about the possibility of using the lunar surface to communicate between points on earth when the ionosphere is disturbed by magnetic storms.

Radio waves bounced off the planets would give much more information than now available about their distances and the composition of their atmospheres.

In addition to picking up radio waves beamed to the sun and reflected back, astronomers can also tune in on the noise the sun itself is making. They are particularly interested in the

mysterious "M" regions that seem to be tied in with the magnetic storms that disturb shortwave communications on earth.

No scientist has yet found anything visible on the sun's surface to correspond to these M regions. By looking directly at the sun with radio waves, they hope to pinpoint some particular spot as the source. Doing so would then lead to much more accurate prediction of the ionospheric storms that plague shortwave users.

Martian "Canals" as Streaks

► THE MARTIAN "canals" look like "continuous streaks" on the red planet's surface, says Dr. H. Percy Wilkins, fellow of the Royal Astronomical Society and world authority on the moon.

Dr. Wilkins, on returning to England after a six-week visit to several astronomical observatories in the United States during the summer, said that he spent most of his telescope time viewing the moon. However, he did take time to look at Mars with the 60-inch reflector at Mt. Wilson, Calif. With that instrument, he said, he saw the so-called canals "distinctly."

Concerning his favorite astronomical object, the moon, Dr. Wilkins said that there might be large numbers of valuable crystals on the lunar surface, but that man would not know for sure until he landed there.

The specific gravity of the lunar crust is about equal to that of a diamond, he pointed out, but this does not mean that its surface would be covered with diamonds.

Some of the moon's craters, Dr. Wilkins said, are "definitely" due to internal forces, probably modified vol-

canic action, and others are due to meteoritic bombardment. Either volcanoes or meteors would cause fusion of some of the lunar surface, and this could give a crystallized carbon not, however, in the form of diamonds.

The "tunnel" on the moon discovered by the late amateur astronomer, John J. O'Neill, is actually a bridge, Dr. Wilkins believes. He is convinced that there is a "small, natural aperture or hole" about two miles from one side to the other. Although this may seem big, Dr. Wilkins pointed out that with the moon's lower gravity, it is not so surprisingly large an aperture since a force exerted on the moon gives six times the effect of the same force exerted on earth.

"There are many strange effects in the particular region where O'Neill's bridge is found," Dr. Wilkins said. These have to be interpreted by looking at the "remarkable" shadows.

He likened it to trying to tell what the earth's surface is like by looking down at it from an airplane more than 300 miles up. The smallest point that can be distinguished is about two miles across, he said, but since the moon has no atmosphere to mention, there is no veiling effect as there would be looking down on the earth.

Volcanic Ash on Mars?

► THE DARK markings on the red surface of Mars may be drifts of volcanic ash, not vegetation as many have proposed.

Active volcanoes on Mars are suggested by Dr. Dean B. McLaughlin of the University of Michigan as the most plausible source of material such as is required to make the volcanic drifts. He told the American Astronomical

Society at a recent meeting this idea is based on his analysis of the pattern of prevailing winds that should occur on Mars.

Astronomers all over the world trained their telescopes on this fascinating planet this summer, for it made a very close approach to the earth. On July 2, it came within about 39,800,000 miles of us.

The dark green markings seen on the surface of Mars, Dr. McLaughlin believes, are mostly elongated streaks whose directions closely match those of the strong winds during Martian summers. During other Martian seasons, while the winds will have other directions, they will be so much weaker that they cannot erase the pattern of drifted ash formed during the summers.

In the dry, oxygen-poor atmosphere of Mars, volcanic ash should be green rather than brown as on earth, he suggested. It has long been known that the dark areas on Mars become greener during the planet's summer, and some theories attribute this to the growth of vegetation.

However, the Michigan astronomer pointed out that this color change is just what would be produced by the greater spread of the green ash by the strong prevailing winds at that season.

Mars' canals, according to Dr. McLaughlin, would be long, narrow, ash drifts, or in some cases, volcanic rifts in the planet's crust. According to the astronomer, the conditions on Mars correspond to an early stage in the earth's development, so that the red planet may possibly be one on which oceans have yet to form, and on which life is still to appear.

For The Home Lab

Synthetic Rubber

by BURTON L. HAWK

► DURING the years between the two wars the supply of natural rubber was more than ample, and the product was available cheaply and in abundance. Consequently, little thought was given to any synthetic replacement. When the second war began, however, the supplies of natural rubber dwindled rapidly. If we were to continue our position in the war it became necessary to find another source of the all-important rubber. It was up to the scientist to produce this source. And, as many times in the past, when the need for a particular item arose, science found a way to obtain it. It was not long before synthetic rubber was prepared in the laboratory and followed shortly thereafter by industrial production.

Many types of synthetic rubbers have been prepared and new combinations are being discovered constantly. Indeed, what is considered brand new today is already out-dated tomorrow.

Synthetic rubber is produced through a process known as *polymerization*, which involves inter-molecular combinations. The *polymers* resulting from this reaction are of the elastic type, such as synthetic rubbers, and the non-elastic types, such as synthetic plastics. The rubber-type of compounds are known as *elastomers*. Actually, the elastomers do not duplicate natural rubber. They are separate products *similar* to natural rubber, and in many respects superior to the natural product.

Among the many types of rubber-like compounds are the butadiene rubbers, piperylene rubbers, isoprene rubbers, dimethylbutadiene rubbers, haloprene rubbers (such as neoprene), elastolenes (such as Butyl rubber) and elastothiomers (such as Thiokol). Of this group, Thiokol is perhaps the most easily adapted for home laboratory preparation. It is produced essentially from the reaction of sodium tetrasulfide with ethylene dichloride.

Dissolve 3 grams of sodium hydroxide in 60 cc. of water. Place the solution in a large beaker and heat to boiling. To the boiling liquid, add 6 grams of finely powdered sulfur. Add small portions at a time, stirring constantly. After all has been added, continue stirring and heating for a few minutes. Then, remove the heat, add about 50 cc. of water, stir, and filter off any unreacted sulfur. The resultant filtrate should be a clear red liquid (sodium polysulfide).

For an emulsifying agent, we will use a soap solution. Dissolve about one-half gram of soap flakes (such as "Lux" or "Ivory") in 10 cc. of hot water. Heat the sodium polysulfide solution prepared above in a large beaker to a temperature of 70 degrees, and add the soap solution to it. Next, while stirring, add 10 cc. of ethylene dichloride in small portions. It is important that you keep the temperature at 70 degrees. If it should rise, remove the heat immediately and if necessary cool the beaker externally. Continue

stirring at the 70-degree temperature until the liquid becomes milky-white in color. The solution will pass through various shades of orange, yellow and ivory. But do not be satisfied until you obtain an entirely white color. This white emulsion is the "latex." Cool the solution and add 5 cc. of concentrated ammonium hydroxide, which will act as a stabilizer. Stir again and allow the mixture to stand for a day or two.

The latex emulsion will gradually settle to the bottom of the container. Carefully pour off the clear liquid from the top. Then add the white emulsion to 150 cc. of water in a beaker. Add 5 cc. of concentrated ammonium hydroxide and stir well.

Our final step is to coagulate the rubber. This can be done with dilute acetic acid (about a 20% solution). Add the acetic acid in small quantities with continual stirring until the Thio-kol separates out of solution as a lump in the bottom of the container. Remove the lump and wash it thoroughly with water. This is the crude synthetic rubber. Note that it is moderately elastic.

The elasticity can be increased by treatment with zinc oxide and carbon black. Place the lump of rubber in a

mortar. Add about one-half gram of zinc oxide and a small pinch of carbon black. Work the chemicals into the rubber by kneading with the pestle. Do not grind—rather press the chemicals in. Note the elasticity after you have treated the rubber for about 15 minutes.

The procedure you have just completed is similar to that of processing natural rubber. The difference, of course, is that the milky latex is obtained from the rubber tree instead of from chemical reaction. The natural latex is also stabilized and then coagulated with acetic acid. This rubber is then vulcanized and further treated with carbon black or zinc oxide which help to increase its resiliency, strength, and toughness.

Natural rubber is a complex polymerized form of isoprene. The Thio-kol that you have prepared is actually a "substitute" rubber. It is unaffected by hydrocarbons and most solvents. Thus it is used in making hoses used to handle such liquids.

So much for synthetic rubber. A life saver during times of war. A mighty important supplementary product during times of peace. Another triumph of chemistry!

High Neutron Source Available

► A UNIQUE research tool, a high intensity neutron source, is now available to the public at the Materials Testing Reactor, Arco, Idaho, of the Atomic Energy Commission, the AEC has announced. This reactor can produce isotopes of higher specific radioactivity than the Argonne, Brookhaven or Oak Ridge reactors, where irradiation services are also available

to the public.

Portions of the area of the reactor's greatest neutron intensity, used primarily for AEC projects, may also be provided from time to time. The AEC's program will have first choice, however, and security will not be endangered since the actual experiments at the reactor will be done by cleared personnel.

Tagged Atoms Give Lead To Radiation Injury Cure

Medical Help From Radioactivity

► A CURE for atomic radiation sickness is in the works. Whether it will be ready in time to help any future victims of accidental radiation exposure, such as that from H-bomb tests, or of intentional military use of nuclear weapons cannot be told at present.

So far, however, scientists have found a way to cure radiation sickness in mice. And they have insight into a fundamental mechanism of body chemistry which must be acted on by medicines designed to save radiation victims.

This much appears from a report by Dr. R. K. Main, chief radiological chemist in the U.S. Naval Radiological Defense Laboratory, San Francisco, to the American Chemical Society.

The mice were cured of their radiation sickness by a "spleen protective factor" obtained from the spleens of young mice. Discovery of this factor was made at the University of Chicago.

How the spleen factor works, which should help toward making a radiation sickness medical cure, was discovered with the aid of radioactive carbon 14. This was used as a tag for a formate chemical. The tagged formate was injected into the mice which were then exposed to X-rays. These studies showed that the tissues of the irradiated mice could not make purines. Purines are chemicals important for building nucleic acids. These acids, in the nucleus of each cell, are intimately

associated with cell division and growth.

When the irradiated mice were injected with spleen protective factor, the carbon 14 studies showed that seven days later the mouse body cells were again able to make purines.

From this lead may come the building of chemicals that can save humans as the material from young mice spleens saves other mice exposed to killing radiations.

Associates of Dr. Main in the study were L. J. Cole and Dr. R. V. Pond.

No Blast Treatment

► SCIENCE has no "wonder" drug for the treatment of radiation injury from A-bomb and H-bomb blasts.

So reports Dr. Thomas Haley of the University of California at Los Angeles Atomic Energy Project, who recently completed a survey of the status of radiation injury therapeutics.

He points out that blood transfusions and antibiotics are the only measures of proven usefulness for treatment of radiation injuries at the present time.

"Why is there likely to be no 'wonder' drug which will single-handedly counteract radiation effects?" Dr. Haley asks. Here is the reason: Treatment must of necessity be a multiple one because the damage produced is multiple, involving almost every body tissue.

Such drugs as flavonoids and toluidine blue originally showed some

promise. But evidence now indicates that flavonoids are of little or no value and that toxic side effects of toluidine blue make it a questionable therapeutic agent.

Some factor in the spleen seems to be vitally concerned with survival. Work in progress may result in isolation of this factor, but much more research would be necessary to determine the place of spleen extracts in treatment of radiation injury.

Plasma volume extenders and ACTH have shown promise in treating some phases of radiation injury, but their true value is as yet to be determined, Dr. Haley concludes.

Oxygen a Protection

► DISCOVERY that oxygen can protect against ionizing radiation, such as that from A-bombs, H-bombs and X-rays, has been announced by Drs. C. S. Bachofer and M. Aelred Pottinger of the University of Notre Dame.

This is the first clear-cut case of oxygen protecting organisms against ionizing radiations, they state.

The organisms protected in their experiments were the tiny particles of bacteriophage T1, strain B. This phage acts specifically against the micro-organism, *E. coli*, or the colon bacillus as it formerly was called.

Oxygen protected these phage particles against both X-rays and cobalt-60 gamma rays.

Heretofore oxygen has been reported most often as sensitizing organisms to radiation, making them more susceptible to radiation damage.

Whether the oxygen protecting effect is specific for this particular bac-

teriophage is a fundamental question still to be answered. Oxygen may have the same effect in organisms of more complex organization, such as higher animals and even man, but its effect may be obscured in the more complex organization, the Notre Dame scientists suggest.

The presence or absence of oxygen may change the phage particles in some way, thus changing their resistance to ionizing radiations. Or the protective effect may be due to suppression or enhancement of certain products of irradiated water. The phage particles were suspended in water when irradiated in the tests.

These problems are under consideration, the scientists stated.

Radioactive Addiction Clues

► THE FIRST human studies with radioactive morphine have given University of California scientists a clue that may have some significance in addiction to the drug.

The scientists found that the only addict studied eliminated the drug faster than normal people. They said this suggests the need for further studies to determine if addicts characteristically handle morphine faster.

The scientists also found that the drug is broken up in the body and eliminated more rapidly by normal people than had been suspected.

They used morphine with built-in radioactive carbon. Each dose contained less radioactivity than everyone receives daily from cosmic radiation, but enough to follow through the body with sensitive counter devices. The doses given were therapeutic doses, about as much as a doctor gives in normal practice to relieve pain.

Soon after administration, part of the radioactivity began to appear in the breath, reaching a peak in one hour and declining to a low level after six hours. Six hours is about the time the physiological effect of the dose wears off.

Elimination of the radioactivity-containing segment of the morphine molecule indicated that the body starts breaking up the drug molecules soon after intake. Most of the radioactivity is eliminated within 24 hours.

The object of the study is to learn just where and how morphine acts in the body. With better knowledge, the scientists hope to develop drugs that will do the same job as morphine without causing addiction.

The research was done in the School of Medicine, San Francisco, and the Radiation Laboratory, Berkeley, by Drs. H. W. Elliott, T. K. Adler, H. H. Anderson, B. M. Tolbert and Henry Rappoport.

Arsenic Finds Brain Tumors

➤ BRAIN TUMORS, which make up five percent of all cancers, can be spotted early by radioactive arsenic, in a paper pattern method announced to the American Medical Association.

The method was devised by Dr. Gordon L. Brownell, physicist, and Dr. William H. Sweet, brain surgeon, of Massachusetts General Hospital, Boston.

Radioactive arsenic is injected into the patient's veins. The amount of arsenic is so small it cannot poison the patient. Then the patient lies for one hour with his head comfortably supported between two Lucite arms, or grids, connected to a machine which detects and records radiation densities.

Radioactive arsenic is one of several chemicals which concentrate in brain tumors. The machine continuously scans the head at a predetermined rate to pick up the arsenic location. Then it prints on a paper outline of the head a pattern of either curved or straight lines.

If a tumor is present, the lines are close together over the exact region of the tumor. If the lines are curved, this means the tumor is on the right side. If they are straight, the tumor is on the left.

The method is painless and simple for the patient. It does not involve an operation to inject air or dyes into the head, as previous methods do. It has been used on some 300 patients with about 75% accuracy in spotting brain tumors and even higher accuracy in spotting brain abscesses.

Dr. Sweet now considers it so accurate that if the patient's symptoms point toward a brain tumor and the new machine confirms this, he operates without resorting to other methods for determining the tumor's location.

He and Dr. Brownell are working on a new machine which they expect to have an even higher accuracy rating.

One important advantage of the new method is that it can distinguish between brain tumor and a clot or hemorrhage of the brain. The arsenic does not pour into the bloodless or hemorrhagic area of the brain. This should be valuable in older patients who might from the symptoms have either a tumor or a stroke from blood clot or hemorrhage of the brain.

In many of these, marked improvement following the attack leads to the

assumption that it was a stroke. Then the tumor may be overlooked until it gives further symptoms, by which time it may be too late to save the patient.

The radioactive arsenic tumor detection method differs from other radioactive chemical detecting methods. Instead of depending on the gamma rays from the radioactive chemical to spot the tumor, it depends on annihilation of positrons. When these are given off by the radioactive arsenic and collide with an electron, the positrons are annihilated. Then two electromagnetic quanta leave the scene back to back.

The new machine is designed to record each photon of the annihilation pair. This "coincidence counting system" eliminates scattered radiation which would obscure the tumor pattern and gives a more accurate and exact picture of the tumor.

Radio-Iodine Helps Palsied

► SOME PALSIED patients, victims of Parkinson's disease, can be helped by a single dose of radioactive iodine.

Improvement that could be determined by the doctors in six of nine patients, with three others saying they felt better, was obtained by this treatment. Drs. Robert S. Schwab and Earle M. Chapman of Boston reported at the meeting of the American Neurological Association.

The idea of using this treatment came from experience with a patient who in 1937 had his entire thyroid gland removed to help his heart disease by slowing down the rate at which his body metabolic processes went. This patient also had Parkinson's disease. This improved after the

thyroid was removed. Failure to help another Parkinson's disease patient by this operation discouraged further trial of it.

When, however, radioactive iodine became available it was possible to determine accurately the thyroid function of Parkinson's disease patients. As a result, a dose calculated to reduce the metabolism without producing the thyroid deficient state of myxedema can be given. A single dose lasts indefinitely.

Of 18 patients studied, only nine were given the treatment. The Boston doctors reported patients were selected according to the four following criteria:

1. Evidence of being unable to stand heat, excessive perspiration and other signs suggesting raised metabolic rate.
2. An incapacitating tremor, particularly one that increases under stress and emotional pressure.
3. Difficulty in maintaining weight so that over the years there is steady weight loss in spite of diet and vitamins.
4. Thyroid function in the upper range of normal or above as shown by radioactive iodine tracer test and determination of the serum protein bound iodine.

Check on Bone Mending

► A GEIGER counter check on the blood supply through the thigh bone is expected to help surgeons get better results in repairing broken hips.

The new aid was announced by Dr. H. B. Boyd of the University of Tennessee College of Medicine, Memphis, at the meeting of the American Orthopedic Association.

In about a third of the cases of broken hips involving the head of the femur, or top part of the thigh bone, this part of the bone begins to crumble and die about 12 months to two years later. The condition results from inadequate blood supply to the top of the thigh bone. When this happens, a second operation is needed.

Unfortunately, the surgeon does not know at the time he repairs the broken hip whether the patient is likely to develop this condition, known as aseptic necrosis.

Dr. Boyd and associates believe this difficulty can be overcome by giving the patient a tracer dose of radioactive phosphorus. The largest amount of this will be carried by the blood to the bones. Using a Geiger counter, the amount in the bone pieces on either side of the break can be measured. If there is as much radioactivity in the head of the bone as in the long part, the surgeon can conclude the blood supply to the top of the bone is sufficient.

If, however, the amount of radioactivity in the top of the bone is five to 10 times less than the amount in the long part, the blood supply is probably not adequate and the chances are great that the patient will develop aseptic necrosis later. With this as a guide, the surgeon can modify the repair operation to decrease pain, disability and future reconstructive operations.

An estimated 60% of the potential managerial talent of engineers is being lost to industry due to poor communications between engineers and the top management.

Vacuum-cast metals, such as copper, are melted under pressures as low as one one-hundred-thousandth of an atmosphere to dispose of gases dissolved in the metal.

The test is now being tried on patients, but it will take about two years to determine the accuracy of the method.

Working with Dr. Boyd to develop the test were Drs. Donald B. Zilver-smith and R. A. Calandrucchio and Miss Betty Houston, research assistant.

Radioactivity Near Limits

► THE AMOUNTS of radioactive substances normally deposited in human bodies, even when they are not exposed to fall-out ash or other radioactivity from A- and H-bombs, are close to the accepted tolerance figures.

This finding comes from studies by Dr. A. T. Krebs of the Army Medical Research Laboratory at Ft. Knox, Ky.

The amounts of radium element Dr. Krebs found in normal bodies, however, seem to be well below the accepted permissible radium content.

In reporting his study to the journal *Science*, Dr. Krebs pointed out that measurements of radioactivity in the human body should be interpreted with regard to whether the element radium is being measured or the radioactivity from other elements in the body, such as potassium and carbon.

The amounts of radioactive substances in normal bodies, although they bring the "irradiation burden" close to accepted limits, are nevertheless much lower than the toxic amounts found so far in radium poisoning cases.

Misshapen Molecules Sought as Cause of Unconquered Diseases

Wrong Hemoglobin in Anemia

► CAUSES of unconquered diseases, including cancer, are being sought in misshapen molecules in the human body.

This new direction for research is being undertaken because diseases not caused by infections, but occurring because the body builds the wrong kind of molecules into the blood cells, have within the past five years become the most thoroughly understood illnesses.

These are the sickle cell anemias, first recognized in 1911. The cause of this type of anemia was found in 1949 by research workers associated with Dr. Linus Pauling at California Institute of Technology. Abnormal blood cells are to blame. The red coloring matter forms long strings that stick together and twist the red blood cells into the shape of a sickle blade. The condition is inherited and occurs almost exclusively in Negroes. So long as only half the red cells are abnormal, the individual is not sick, but is a carrier of the dangerous hereditary trait. Anemia appears among children when both parents are such carriers. Theoretically, one fourth of such children are free from the condition. But half are carriers and the remaining fourth will die because their blood cannot carry enough oxygen to keep their body processes going for a normal lifetime.

The blood cells are normal in everything but the hemoglobin which is responsible for the twisted stringy structure. This makes the cell mem-

branes sticky and the blood sludgy so that it will not flow through the capillaries. Organs are damaged by lack of the oxygen that the blood should bring and does not. Infections set in which the body cannot fight successfully.

The condition is described as an inborn error of hemoglobin synthesis by Dr. Pauling and his associates, Dr. Harvey A. Itano, senior research fellow at California Institute of Technology, Drs. Phillip Sturgeon and William R. Bergren of department of research, Children's Hospital, Los Angeles, and University of Southern California School of Medicine.

This group has identified three additional types of hemoglobin abnormalities, the newest represented by one patient whose case was described by Dr. Itano.

With normal hemoglobin and four abnormal kinds there are 15 possible combinations, because it is possible for an individual to be a carrier of more than one type of abnormality. Nine of the 15 have been identified in patients. Some of the three newer types of blood cell abnormality have been found in members of the white race.

The only treatment which helps these sufferers consists of transfusions of normal blood, and this help lasts only three weeks. By that time the imperfect cells of the patient's own manufacture are making trouble again. Removal of the patient's spleen can be of some help because the spleen

is the organ that destroys damaged blood cells and in this disease the spleen becomes enlarged and both makes and takes out damaged cells too fast.

The California researchers are hoping to find some drug that will have the same effect as supplying more oxygen to the tissues. But whether or not a cure is found, recognition of the possibility that other diseases, which do not yield to known kinds of treatment, may be due to other abnormalities is important.

Some cancers, Dr. Pauling said, will be studied to see whether any factors like those of sickle cell anemia can be recognized. There is also the chance that an abnormality, if found, may not be inborn but may result from

reaction between body cells and some chemical in the environment.

In the early days of rubber manufacture, aniline was used in vulcanization and workers died because aniline changed the oxidation state of the iron in the hemoglobin in their blood. Some such reaction might occur due to certain molecular structures in tobacco smoke or in agricultural chemicals. If it occurred, it might affect any of the one hundred thousand different kinds of protein molecules in the human body.

In the case of sickle cell anemia the scientists had discovered all about the disease only two years after they started looking for abnormal molecules as the possible cause.

Drug Found Useful After 100 Years

► AN OPIUM chemical known for more than a century, and generally considered worthless for all that time, has now found a medical use. It stops coughs and probably will be put into cough drops and syrups before too many more months.

The chemical is narcotine. Unlike other opium chemicals, it does not stop pain and it does not have any sleep-inducing effect. And, fortunately, it does not have the power of other opium drugs to make addicts of persons taking it.

It is the first non-addicting opium chemical with a specific anti-cough effect. A synthetic drug, related to a synthetic pain-killer, has also been found to have anti-cough action without having any pain-relieving action. Discovery of these two drugs has overthrown the long-held assumption that

the cough-stopping action of narcotic drugs, such as codeine, was related to the pain-killing action.

Narcotine's cough-stopping action was discovered in animal studies by Dr. Charles A. Winter and Lars Flataker of the Merck Institute for Therapeutic Research, Rahway, N.J.

Trials in human coughers by Harvard Medical School scientists among others showed that narcotine had definite anti-cough effect and acted rapidly in stopping coughing.

The animal studies showed it to be as good as another opium chemical, codeine, for stopping coughs, and the trials with humans seem to bear this out.

Narcotine is now being made available to drug manufacturers for incorporation in their cough medicines.

Cancer May Have Own Chemical Profile

Findings in Chemistry of Cancer

► CANCER TISSUE may have its own chemical element "profile" or pattern distinguishing it from the pattern of the host tissue in the body that it has attacked.

Cancer that has spread to the liver, for example, has only 18 parts per million of zinc compared to 80 p.p.m. in the uninvolved, or non-cancerous, parts of the same liver. These figures are the average for four cancerous livers. By comparison, six non-cancerous livers averaged 37.7 p.p.m. of zinc.

The differences in the amount of this element in cancerous and normal livers were discovered by Drs. Kenneth B. Olson, George Heggen, Carl F. Edwards and L. Whittington Gorman of Albany Medical College, Albany, N.Y., and the Saratoga Springs Commission Research Laboratory.

Zinc is known as one of the "trace elements" because it appears in such small amounts in the human body. Other elements of which there are only traces in the body include copper, manganese, silver, lead and cobalt.

Dr. Olson and associates have developed a method for detecting the quantities of 14 trace elements in body tissue, using spectrochemical methods.

They have so far studied the trace elements in the livers of six persons dying of noncancerous disease, two dying of cancer of the esophagus and cirrhosis of the liver, four dying of gastrointestinal cancer spread to the liver and one case of acute lymphatic

leukemia with liver involvement. In this case, iron, zinc, chromium and cobalt were significantly elevated.

The scientists are exploring the possibility of existence of a trace element profile in cancer and host tissue and also the possibility that the amounts of trace elements in blood plasma may give a clue to the amounts of these elements in the liver and other internal organs.

Cancer From Fat Breakdown

► EVIDENCE of how some cancers are formed within living membranes has been discovered.

Breakdown products of fat dissolved in sesame oil cause experimental cancers in mice. Dr. Fritz Bischoff, Guillermo Lopez and J. J. Rupp of the Santa Barbara, Calif., Cottage Hospital Research Institute reported their findings to the meeting of the American Chemical Society.

Two factors, neither in itself cancer producing, may react together to stimulate abnormal growth, Dr. Bischoff believes.

Chemical breakdown of cholesterol, a substance found in fat, gives products closely related to the sex hormones. Yet neither the cholesterol nor the hormones, nor the sesame oil in which they are dissolved gives rise to cancer when injected separately into experimental animals.

By varying both the breakdown products and the solutions in which they were administered, Dr. Bischoff

and his associates have found that the combination of chemical and oily solvent is probably the key to production of the cancers they have induced in their laboratory animals.

Restraint to Cancer

► GROWTH and cell division or multiplication processes, which when unrestrained lead to cancer, can be unhooked and separated, a Rutgers University microbiologist has discovered.

Using yeast cells, Dr. Walter J. Nickerson has evidence for the existence of a cellular division enzyme separate from the processes of cell growth. In these yeast cells, growth

continues without cell division.

Similar studies in the past with bacteria showed that these single-celled organisms would grow to 400 or 500 times their normal size without ever dividing if the cell metabolism involving iron or manganese were interrupted.

By studying this block in yeast and bacteria, Dr. Nickerson hopes to isolate other factors and chemical chains which participate in the division of living cells. Ordinarily these processes are restrained in higher organisms, but a breakdown in the restraining leads to the rapid growth and division which is called cancer.

Snakeroot Drug For Hypertension

► HOPE for successful treatment of hypertension, the disease of raised blood pressure, is contained in treatment with the drug, alseroxylon, an extract from the snakeroot plant. Drs. William R. Livesay, John H. Moyer

and Samuel I. Miller of Houston, Texas, report 84 cases in the *Journal of the American Medical Association* and conclude that use of this drug combined with hexamethonium can bring control of the disorder.

"Blue" Blood of Lobsters a Mystery

► TRUE "blue bloods" in the animal kingdom are the lobsters, crayfish, crabs and their relatives. A blue copper pigment in their blood serves the same function as iron pigment in human beings.

James Redmond, University of California at Los Angeles zoologist, is making a special study of these blue blooded creatures.

The copper pigment, hemocyanin, serves as a vehicle for carrying oxygen in blue-blooded animals just as the iron pigment, hemoglobin, does in red-blooded creatures, the study

shows.

Whereas the red pigment is capable of carrying oxygen in the ratio of up to 20 cubic centimeters per 100 cubic centimeters of blood, the blue pigment can carry only up to three cubic centimeters of oxygen per 100 cubic centimeters of blood.

Hemocyanin is thought to have evolved from certain copper enzymes, which all red blooded animals, including humans, have in their bodies. Why certain animals developed blue oxygen bearing pigments while others developed red ones is still a mystery.

Farm Wastes Eyed As Industrial Material

Chemistry For Better Farming

► ON THE FARMS of America there are materials which, if they could be utilized, would be worth much as industrial raw material. They would add to the farmer's income.

These are farm wastes. Perhaps it would be better to call them "residues" or "by-products." But there are substantial tonnages on our fields that cannot now be used, either because we do not know enough to do so or because it is too expensive to attempt to gather and process these low-grade materials.

This problem of wastes or residues is quite distinct from the surpluses of conventional agricultural products, such as wheat, cotton, milk, etc., which have been purchased by the Government and stored in order to support farm prices.

Use of these farm wastes has long been a dream of the chemist who has looked to agriculture for his new, and perhaps cheaper, raw materials.

An astounding number of products can be made from plants that grow in the soil. The difficulty is not in using them chemically or industrially, but doing it at a profit in competition with other sources of the raw materials.

Motor fuel can be made from corn. Paper and wallboard can be made from corn stalks.

In the case of corn converted into alcohol and used in automobile engines, this grain is in competition with the oil wells of the world. The price

of corn stands in the way unless the price is disastrously low to the farmer.

In the case of paper making, corn stalks must compete with forests in which the cellulose is included in large, easily-handled logs which are in concentrated and plentiful supply, despite the large demands upon our forests.

An active group of scientists and technologists have considered the industrial utilization of farm products for about two decades. At the recent meeting of the National Farm Chemurgic Council's Conference at Memphis, Drs. K. Starr Chester and Warren C. Ellis Jr. of Battelle Memorial Institute, Columbus, Ohio, observed that biological residues, waste materials from the farm, are widely scattered and the job is to find some economical means of assembling them at a central point where they can be "processed."

Shipping bulky materials to the factory where they will be used is one heavy expense. The Battelle Institute scientists suggest that the farm waste be put through one or two processing stages locally to decrease its bulk and increase its value to the point that it would be economical to ship it. Equipment already in existence might be used. For instance, the cotton gins and canneries could be used during their off-seasons.

Railroads could cooperate by making available portable, semi-processing units that could be shifted from place to place on railway cars.

Important utilizations of agricultural residues that have proved practical have, in most cases, relied upon the material being brought to some one place as a consequence of a major operation. For instance, the bagasse material remaining after the sugar has been squeezed out of sugar cane is conveniently at the sugar mill. Oat hulls used in large quantities for making the basic chemical, furfural, are assembled at a central point in connection with oatmeal cereal manufacture.

All of the residues or wastes are not located on the farm. The scientists suggest that garbage and sewage can be utilized economically if we use our ingenuity. Such materials could be rapidly converted into high-quality humus which many of the soils of our farms need in increasing amounts.

Lignin is another waste material of enormous tonnage which is now largely wasted. This is a major ingredient of wood and a by-product of paper manufacture. Success has not yet come to research attempting to decompose it chemically or by bacterial action but someday lignin may well be a very valuable raw material.

Reduce Crop Surpluses

➤ CHEMICAL warfare against weeds and insect pests could cut farm production costs and help reduce present food surpluses without cutting the farmer's income, in the opinion of Paul Mayfield, president of the National Agricultural Chemicals Association.

The annual crop loss due to weeds and pests is estimated at \$12 to \$17 billion. Mr. Mayfield said that a drop of a third in this loss would make it possible to maintain the nation's pres-

ent farm production with nearly 100,000,000 fewer acres planted to crops.

Since farm costs are related to the number of acres farmed, this acreage reduction would produce the same amount of food at lower costs, less work and more profit.

Mr. Mayfield said that probably no more than 10% of the nation's farmers are now using agricultural chemicals to good advantage.

In certain areas agricultural chemicals are revolutionizing farming. In one year chemical control of the velvet bean caterpillar in Georgia and Alabama saved growers of peanuts and soybeans an estimated \$15,000,000.

Another effect of expanding use of chemicals has been to extend the areas where certain crops can be grown. In the past, Mr. Mayfield explained, it was the practice to move a crop to a new section of the country when pests made profitable production impossible.

With the new organic chemicals, it is possible to raise crops anywhere in the United States that climatic conditions are favorable, he stated.

Mr. Mayfield's report was made in the American Chemical Society's *Journal of Agricultural and Food Chemistry*.

Cattails May Be Profitable

➤ HARVESTING cattails growing in swampy areas will become a highly profitable business some day, two Syracuse University plant scientists predict.

Swamp land may turn out to be as valuable as some of the golden wheat fields of the Middle West, Dr. Ernest Reed, chairman of Syracuse University's department of plant sciences, and Leland C. Marsh of the department's

Cattail Research Center believe. The center was established after research showed that the tall spiked plant has almost unlimited uses.

The world's food problems could be solved in part by growing cattails on a large scale, Dr. Reed said. This plant is known to botanists as *Typha*. Laymen sometimes call it a reed, tule, flag, rush or reed mace.

Nearly a dozen by-products have already been obtained from this "weed," and scientists expect to find several more in the next year.

This is how the Center says the plant can be used:

The "root," or rhizome, can be eaten like potatoes, or ground up to make a flour for baking. Cattail cookies taste good, the scientists said. The starch content is high enough for it to be used as a substitute for cornstarch in pudding. The flour can be fermented to produce ethyl alcohol which is valuable as anti-freeze, for medicinal purposes, as a cheap industrial solvent and many other purposes.

In addition, the flour makes a good substrate for growing some molds from which antibiotics are produced. Fibers can also be produced from the "root."

The stem of the cattail has traditionally been used to caulk the ends of barrels to make them watertight. For centuries the leaves have made rush furniture, baskets and mats. Three companies in northern New York fill the limited demand of barrel makers and supply all of the cattails for rush furniture in this country.

Much more important uses for the stem have now been revealed. Mr. Marsh has extracted soft fibers from

the stems and leaves by treating them chemically. He believes these fibers can be used for most of the purposes that jute is used today—to stuff furniture, make string, burlap, webbing, etc.

Mr. Marsh has also extracted from the stem an adhesive substance, a polysaccharide, that may prove useful as an adhesive for paper, as sizing for paper, and as a smoothing agent for such products as facial creams and shaving creams. The stem is also a good source of ethyl alcohol.

The cattail flower, often thought of as the spike, is also valuable. During World War II, a Chicago company processed several million pounds of the fluffy, fibrous portion of the cattail spike to stuff life jackets, baseballs and mattresses. The fluff also was compressed into sound- and heat-insulator board.

The minute seeds have three possible uses. A drying oil, somewhat similar to linseed oil, can be extracted from them. This oil might be refined for cooking purposes. A wax can be produced from this oil, and the seed meal that remains is a good cattle or chicken feed.

A tremendous yield of cattail "roots" can be obtained. Mr. Marsh found that he could harvest 140 tons of rhizomes per acre near his home in Wolcott, N. Y. This is more than 10 times the yield of potatoes per acre. The dry weight, as measured by the tons of flour which could be produced, is 32 tons.

Farmers should not start harvesting their cattails, Dr. Reed warned, until there is a demand for them from industry.

World Food Supply Doubled

► THE WORLD food supply could be easily doubled through modern engineering and agricultural technology, Lord Boyd-Orr, Nobel prize winner and famed British food authority, declares in a recent report to the Nutrition Foundation.

The doubling of the food supply will be needed within the next 25 years if the anticipated increased numbers of people in the world are to be fed enough food of good enough quality to maintain full health and vigor.

How this might be done and what it would mean are described by Lord Boyd-Orr as follows:

Soil erosion which is believed to have destroyed or damaged about half of the original fertile areas of the earth would need to be halted by vast forestation projects on every continent and the destructive force of river floods converted by projects like the T.V.A. to hydro-electric power and irrigation. Deserts once fertile would need to be reconditioned.

These projects, some of which are

already being carried out in different parts of the world, together with the need for millions of tractors and other agricultural equipment to modernize primitive agriculture, and the setting up of the necessary secondary industries for the maintenance of equipment and road and rail means of transport for food, would demand enormous quantities of industrial products. Then, as agricultural products increased, the enhanced purchasing power of the 60% of the families in the world engaged in agriculture would provide an expanding market for consumer goods.

Thus a world food plan, based on human needs, would provide a greatly increased world market for industrial products. As the creation of wealth, in this case beginning with food, is a cumulative process, it would contribute to the rapidly expanding world economy which is needed to balance the growing industrial potential and also to take up the slack as rearmaments slow down, and so keep the wheels of industry turning with full employment and economic prosperity.

Seed Clouds With Salt For Rain

► CLOUD SEEDERS may some day make rain by throwing common table salt into clouds.

This is foreseen from studies being made at Woods Hole, Mass., of how bursting bubbles throw salt particles into the air. The tiny sea water bubbles, as they break, form even tinier jets. It is these jets that eject the salt-containing droplets, Alfred H. Woodcock of the Woods Hole Oceanographic Institution has found.

C. F. Kientzler, A. B. Arons and D. C. Blanchard, also of the Institution, collaborated in the motion-picture studies of how small bubbles explode.

Many meteorologists now believe that natural salt particles in the air are rain-making agents. The bubble-bursting experiments were sponsored by the Office of Naval Research to find out how salt gets into the atmosphere naturally.

Difficult Engineering Of the Newer Metals

Hot Rods

Reprinted from the Industrial Bulletin of Arthur D. Little, Inc.

► ATOMIC energy is becoming more and more a field for industry, and one offering a variety of problems for industrial research. Many of these problems are metallurgical, since most familiar construction materials will not meet the requirements of a nuclear reactor. Such metals as uranium, zirconium, thorium, titanium, vanadium, and beryllium have become increasingly familiar, as ways to produce and use these metals, new to industry, have been worked out.

Zirconium, for example, is potentially important as a corrosion-, heat-, radiation-, and acid-resistant material for the chemical industry. It withstands superheated water and steam, used increasingly as chemical manufacture tends more toward extreme reaction conditions. Zirconium tubing, only recently available, has been proposed for use in critical chemical applications. Similarly, the cermets—mixtures of ceramics and metals, produced by powder-metallurgy techniques—have been studied as a part of nuclear technology. Designed for high-temperature service, they are still largely in the experimental stage.

Engineering for the newer metals is frequently difficult. Beryllium, zirconium, and uranium, for instance, are chemically highly reactive under certain conditions; they must be melted in special crucibles. Processing must often be carried out in a vacuum to prevent reaction with air, and formed objects must often be carefully cooled

to prevent distortion. Machining the new metals and alloys to close tolerances also presents problems, as does inspecting them for satisfactory wear while they are inside a "hot" reactor.

One of the major problems of nuclear technology is recovery of nuclear fuels. Solid fuel elements (e.g. coated rods of uranium) used in a reactor become contaminated by the "ashes" of nuclear fission, and such elements must be changed frequently. The remaining fuel must then be purified and formed into a new element. The fuel elements themselves are far from simple. Uranium, for example, must be protected against the coolant materials used to carry away heat generated in the reactor, and the coolant itself must not become contaminated. Thus, a uranium fuel rod must usually be covered with some protective metal. The coating must be strongly bonded to the uranium for good heat transfer, but this bonding makes for difficulty in subsequent recovery of the fuel. Most reactor installations will therefore probably require companion chemical and/or metallurgical recovery units, implying another multi-million dollar industry paralleling the atomic power industry itself.

Underlying the engineering phases of nuclear metals technology is a continuing need for basic research in such areas as measurements of physical properties, X-ray analysis of crystal structure, physical metallurgy, study of radiation damage, and the like.

Patents for Chemical Substances

To obtain a copy of any patent, order by number from the Commissioner of Patents, U. S. Patent Office, Washington 25, D. C. Enclose 25 cents for each, in coin, money order or Patent Office coupon, but not stamps.

Greaseless Bake Pans

► **CHEMISTRY** has come to the aid of the baking housewife. Harold A. Clark of Midland, Mich., patented a resin compound for coating baking pans which eliminates the need for greasing the pan.

A polysilane-polysiloxane resin coat is applied to a clean baking pan. This resin is dried to remove the solvent and then may be used immediately for baking. In this case the first baking use cures the resin, or the pan may be heated before cooking use to cure it.

The coating resin patent was assigned to the Dow Corning Corporation of Midland. It was awarded patent No. 2,672,104.

Unique Storage Tank

► **WHEN** large tanks are used to store liquids or gases, the steel used in the tank must be thick to stand the pressure. Welding thick steel plates, however, is frequently very difficult.

Harry C. Boardman of Chicago, Ill., has patented a tank made of intersecting spheres stacked on top of each other. The tank, due to its design, has sides that are thinner than would be the sides of a single sphere of the same capacity.

Steel plates are placed in the tank along the planes of intersection. The invention, patent No. 2,672,254, was assigned to the Chicago Bridge and Iron Co.

Seed Coating

► **A SPECIAL** coating for seeds that protects them from injury by weed killers put on the soil has been patented by Phelps Vogelsang of Midland, Mich.

Seeds may be coated with fungicides, fertilizers and other nutrients by using a cellulose plastic. It is frequently desirable, however, to apply a weed killer to the soil at the same time seed is planted. This sometimes injures or kills the germinating plant.

If the seed is also coated with a highly adsorptive substance, this may be prevented. In adsorption, the weed killer is held to the surface of particles of activated charcoal or a similar substance. This prevents the herbicide from injuring the seed. Receiving patent No. 2,671,985, the patent was assigned to Processed Seeds Inc. of Midland.

Longer-Lasting Roads

► **A PROMISE** of better, longer-lasting asphalt roads is held out to motorists and state highway departments by a new process in which the bituminous surface is made to cling to its pebbles more firmly.

The process calls for asphalt to be heat-treated with a tiny amount of phosphorus sesquisulfide. The asphalt

can be in the form of asphaltic rocks, tars and pitches obtained in the distillation of coal, wood or petroleum residue.

The process improves the ability of asphalt to resist the action of heavy rains which often wash the rocky road bed away over a period of time, causing the road to go bad.

It was worked out by John D. Bartleson of Beachwood Village, Ohio, who was trying to improve a previous process patented by a fellow worker at the Standard Oil Company, Cleveland. Mr. Bartleson assigned his patent, No. 2,673,815, to the Standard Oil Company.

For Allergic Babies

► A PULVERIZED, mineral-enriched meat has been developed for babies who are allergic to cow's or human milk. It is formulated to provide the minerals and vitamins necessary for the infant to grow sturdy bones and sound teeth.

Possessing "an appetizing and agreeable flavor and aroma," the meat is a powdered beef mixed with minerals, sugars and vitamins. Inventor Haines B. Lockhart of Chicago, who assigned patent No. 2,673,803 to Swift & Co., states that the baby food can be stored indefinitely in its can without refrigeration.

Many babies are allergic to cow's milk, he said. They develop colic, diarrhea, nutritional skin blemishes and dermatitis. A few babies are allergic to human milk. Often it is hard to find the proper kind of human milk for these youngsters, and it usually is expensive when found.

A-Bomb Radiation Detector

► ONE of the problems doctors face in treating casualties of nuclear radiation

is that of separating the physical effects of the blast from the radiation effects.

The Japanese fishermen, caught in the force of the March 1 H-bomb test at Eniwetok, were showered by radioactive ash from the explosion. Although it is usually possible to determine broadly the exposure level that the victim receives, a more precise knowledge would aid in medical treatment.

A device resembling a small flashlight cell has been patented and is designed to give more accurate indications of the radiation dose received by the user. Carried about the neck or wrist, or in a pocket, the device changes color in proportion to the severity of atomic radiation. An attached color chart permits the doctor to see at a glance how badly the victim has been irradiated.

Invented by Herbert Friedman of Arlington, Va., the "dosimeter" received patent No. 2,673,934 and was assigned to the Navy.

Titanium "Skin" Treatment

► A METHOD of giving titanium a hard outer "skin" has won a patent for Inventor Peter P. Alexander of Beverly, Mass.

Titanium is considered one of the "wonder" metals for jet planes. It is light and strong under high temperatures that weaken other metals used in airplanes.

Now with the treatment worked out by Mr. Alexander, titanium alloys can be given a tough surface comparable to case-hardened steel. Powdered tungsten carbide, titanium carbide, chromium carbide, tantalum carbide, zirconium carbide and nitrides of the corresponding metals can be washed

over the titanium article in a slurry of molten titanium or zirconium alloys.

When heat-treated, the surface metals are bound to the titanium object firmly while the slurry of the titanium or zirconium alloy seeps into the object. Mr. Alexander assigned his patent, No. 2,674,542, to Metal Hydrides Inc., of Beverly.

Sparkling Photographs

➤ **SPARKLING** photographs, with whiter whites than ordinary, could be obtained if certain fluorescent compounds were added to the printing paper. The chemicals would glow a brilliant white under ordinary light.

Inventors Milton Louis Hoeffle and Robert Walter Wynn of Easton, Pa., who assigned patent No. 2,674,604 to General Aniline and Film Corp., New York, also state that the chemicals could be added to household soaps and detergents to produce cleaner-looking shirts and sheets on washdays. This would materially reduce the amount of bleach required, they said.

For Sugar Cane Mills

➤ A **REMOTE** control system has been patented that permits a single operator to shut down a string of turbines in sugar cane mills, or to adjust the speeds of the turbines individually or as a group.

Invented by Maynard D. Church of Wellsville, N.Y., the system is designed to improve the efficiency of sugar cane mills by releasing the turbine engineer from the routine work of stopping and starting turbines.

The system would be of especial value when trouble occurs and the plant must be shut down in part or in toto. A single operator working at a remote point could stop the machines

while the turbine engineer hastened to the unit giving the trouble. When the faulty machine had been repaired, the remote operator could start the turbines quickly, reducing the time that the plant is non-productive.

Mr. Church assigned his patent, No. 2,674,854, to the Worthington Corp.

Food From Hide Scraps

➤ A **LIQUID** food that can be blended with soups, purees and vegetable or meat products can be made from hide scraps in meat packing plants, according to David Torr of New York City who assigned patent No. 2,676,168 to Charles J. Ely of Oakland, N. J.

The hide-treating process turns out a gelatin-like mixture of high protein content. The product also can be made into glue and used as a coating for papers and textiles. Sheets can be formed as a substitute for leather, Mr. Torr claims.

Anti-Glare Goggles

➤ **FINE** metallic coatings on eyeglass lenses some day may protect the wearer from the glare of a bright morning sun, from blinding rays reflected from arctic ice and from the dazzling brilliance of headlights at night.

The coating would be applied to the lenses in graduated thicknesses, presumably so the wearer could control the degree of "glare-squelch" he needed. Metals such as aluminum, chromium, copper, nickel and some metallic oxides would be suitable for coating purposes.

Patent No. 2,675,740 was granted to Inventor Dwight W. Barkley of Cheswick, Pa., who assigned it to the Libbey-Owens-Ford Glass Company of Toledo, Ohio.

Book Condensations

FROM ERRAND BOY TO MASTER PHYSICIST, MICHAEL FARADAY—Harry Soottin—*Messner*, 180 p., \$2.75. The life of a great physicist.

BIOCHEMISTRY—Abraham Cantarow and Bernard Schopartz — *Saunders*, 848 p., illus., \$11.00. A text for first-year medical students.

CHEMISTRY ACTIVITIES — Robert H. Carleton, John H. Woodburn and Thaddeus H. Elder, Jr.—*Lippincott*, 256 p., illus., paper, \$1.48. Covering experiments and exercises accepted as standard for high school chemistry but intended especially for use with "Chemistry for the New Age."

CHEMISTRY FOR THE NEW AGE — Robert H. Carleton, Floyd F. Carpenter and R. W. Woline with the editorial assistance of W. R. Teeters—*Lippincott*, rev. ed., 688 p., illus., \$4.88. High school text, generously illustrated.

THE TRUE BOOK OF SCIENCE EXPERIMENTS — Illa Podendorf — *Children's Press*, 47 p., illus., \$2.00. Simple experiments for the primary aged school child to read about and perform himself.

NUCLEAR REACTOR DEVELOPMENT: Proceedings of a Meeting for Members and Guests, May 24, 1954, Sheraton Park Hotel, Washington, D. C.—*Atomic Industrial Forum*, 99 p., illus., paper, \$5.00. Report of a meeting of an organization which has as an aim the advancement of the peaceful development of atomic energy.

SILICONES AND THEIR USES — Roy McGregor — *McGraw-Hill*, 302 p., illus., \$6.00. Bringing together and

correlating the scattered and confusing information about this important family of chemicals and what they can do. Intended as a non-technical manual for engineers and others making use of silicones.

CRYSTAL GROWTH AND DISLOCATIONS — Ajit Ram Verma—*Academic Press*, 182 p., illus., \$5.00. Modern techniques have destroyed the beautiful illusion of early crystallographers with regard to the symmetrical perfection of crystals.

ION EXCHANGE RESINS IN MEDICINE AND BIOLOGICAL RESEARCH — Harry Sobotka and others — *New York Academy of Medicine*, 262 p., illus., paper, \$4.50. These papers, which were presented at a special conference, describe the use of this new technique in diagnosis and research.

ROGER BACON IN LIFE AND LEGEND — E. Westcott — *Philosophical Library*, 140 p., \$3.75. A compact story of the facts and fiction about Roger Bacon's life, including his studies of science and alchemy.

TOXICITY OF INDUSTRIAL ORGANIC SOLVENTS: Revised in Consultation With the Toxicology Committee — Ethel Browning — *Chemical Publishing Company*, rev. American ed., 411 p., \$8.00. Important to those concerned with the health and safety of industrial workers.

EXPERIMENTAL INORGANIC CHEMISTRY — W. G. Palmer — *Cambridge University Press*, 578 p., illus., \$9.00. With a novel method of presentation, prefacing each chapter with the background and reason for the following experiments.

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► **IRRATHENE 101** is the designation for General Electric's new irradiated polyethylene. It is produced by bombarding polyethylene film, as it moves slowly past a thin stainless steel "window" of a cathode ray machine, with high energy electrons. Such treatment knocks out a few hydrogen atoms from each molecule and sets up carbon-to-carbon bonds between adjacent molecules, causing cross-linkage. There is no residual radioactivity. Now produced only in the form of tape, the new material is to be produced also as containers which stand up under steam sterilization. They will be suitable for packaging and storing a wide variety of chemicals, pharmaceuticals and biological fluids. This information comes from the Research Laboratory of General Electric Co., Schenectady, N. Y.

► **COLLAPSIBLE** containers 8 ft. in diameter and 8 ft. high reduce to only 2 ft. height as empties. These 2500-gallon containers have been developed for bulk shipment of powdery, corrosive or hygroscopic materials, and manufacturers may lease them at a monthly rate, if they wish. There is also a 500-gallon size, and other sizes can be made if needed. They are manufactured and sold by the Providence, R. I., plant of the United States Rubber Co.

► **VISCOSITY** indicating, recording and control systems are offered by the Cincinnati Division of the Bendix Aviation Corporation, under the name Bendix Ultra-Viscoson. They find use in industries using oil blending, fuel atomization, laminating resins, gravure

inks and interface detection. For further information write W. J. Kuertz, Jr., Instrument Sales, Bendix Aviation Corporation, 203 West Third St., Cincinnati 2, Ohio.

► **MAGNETIC** stirring bars can now be used in highly corrosive solutions, thanks to a skin-like coating of Kel-F, the inert trifluorochloroethylene polymer. The polymer is made by the M. W. Kellogg Co., Jersey City, N.J. Permanent magnets are sealed into tubing made of this material, and marketed in three sizes by the Arthur H. Thomas Co., Philadelphia, Pa.

► **PURE AMINO ACIDS**, optically standardized, can be supplied by Schwartz Laboratories, 230 Washington St., Mount Vernon, N.Y. The D-isomers are all made in their own laboratories. Those of the L-isomers which are manufactured elsewhere are standardized by Schwartz at no additional cost.

► **A CHEMICAL** to delay scorching in rubber compounds is offered by American Cyanamid Co., under the trademarked name "Nobs Special." Chemically it is n-oxydiethylene benzothiazole-2-sulfenamide. It is supplied as tan, dustless flakes by Cyanamid's Intermediates and Rubber Chemicals Department, Bound Brook, N.J.

► **CHROMATOGRAPHY** apparatus is specially featured in the new (19th) edition of "What's New for the Laboratory" being distributed by Scientific Glass Apparatus Co., 100 Lakewood Terrace, Bloomfield, N. J.

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